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The railway race from London to Aberdeen was closed on Aug. 22, when the train over the London & Northwestern and Caledonian railways broke its own record. The Great Northern route did not compete, being satisfied with its record of Aug. 21, when the 523 miles were covered in 521 minutes; the London & Northwestern train on that day made its run of 540 miles in 531 minutes. On Aug. 22, this train reduced its time over the 540 miles to 512 minutes, or at the average rate of 63.27 miles per hour for the entire trip, including stops. From Preston to Carlisle, 90 miles, the time was 79 minutes, or at the rate of 68.3 miles per hour, and the average speed over the last 34 miles of this division was 74 miles per hour, the maximum being of course considerably higher. The earlier records of this great railway race were given in our issue of Aug. 29, 1895.

A fast run from New York to Buffalo, 440 miles, was made with a special train Sept. 11. The train left New York at 5:40 a. m., and reached Albany, 143 miles, in 134 minutes, or at the rate of 64 miles per hour, having made the first 70 miles to Poughkeepsie in 62½ minutes, or at about 67 miles per hour. A fresh engine was put on at Albany, and the only other stop was made at Syracuse, at 10:17. Buffalo was reached at 12:34, the run having been made in 414 minutes, or 407 minutes deducting the time consumed in the two stops and in the slow run from East Buffalo to Buffalo. The average speed for the entire run was 64½ miles per hour. The train was made up of a baggage and smoking car, 83,470 lbs.; two day cars, 165,840 lbs., and a private car, 109,000 lbs., the total weight behind the engine being 358,310 lbs.

The contract for a new water supply for Jersey City was awarded to the Jersey City Water Co. on Sept. 5, the Board of Finance concurring, by a vote of 3 to 2, in the award made by the Street and Water Board. It will be remembered that the Board of Finance originally refused to approve the award until the advice of a competent expert had been secured as to the relative merits of the several offers. The change of the vote of one member of the board caused it to recede from this position and approve the contract. The award has still to be approved by the Mayor, and if it is so approved is to be contested in the courts. The Jersey City Board of Trade adopted resolutions on Sept. 8 condemning the city authorities for their action in making the award to the Jersey City Water Co., on the ground that the price of $7,950,000 is excessive.

The new lock of the Canadian canal at Sault Ste. Marie, described in our issue of March 28, was opened Sept. 9. The cost is said to be about $4,000,000. According to press accounts, the original contract, let in November, 1888, was for a lock 600 ft. long, 85 ft. wide and 16.3 ft. deep on the miter sill. In May, 1891, the dimensions were changed to 650 ft., 100 ft. and 19 ft., and finally, in April, 1892, to 900 ft., 60 ft. and 20.3 ft. respectively. The width of 100 ft. was adopted in order that a propeller with tows alongside could pass through, but as this system of towing has been dying out the width was reduced to 60 ft. The average cost of masonry is said to have been $12 per cu. yd., as against $14 for the lock on the American side of the river.

The convention of the International Deep Waterway Association is to be held at Cleveland, O., on Sept. 24, 25 and 26, and a large attendance of representatives of boards of trade, chambers of commerce, and other public bodies interested in transportation is expected The Association was organized last year at Toronto, Ont., and its object is to extend ocean navigation from Atlantic ports to and along the Great Lakes. A number of papers will be presented, including one by Mr. Isham Randolph, Chief Engineer of the Chicago Drainage Channel. The President of the Association is Mr. O. A. Howland, of Toronto. The Vice-Presidents are: For the United States, Mr. Lyman E. Cooley, Chicago, Ill.; for Canada, Mr. James Fisher, Winnipeg, Man.; public bodies interested in transportation is expected. Capt. J. S. Dunham, Chicago, Ill., is the Treasurer.

A summary of vessels of all nations lost, condemned, etc., in 1894, has been issued by "Lloyds Register." The figures for the leading maritime nations are as follows:

Flag.	Tonnage. Total owned.	Tonnage. Lost, 1894.
British—United Kingdom	11,807,010	258,561
British—Colonies	1,162,941	52,703
U. S. of America	2,171,459	65,615
Austro-Hungarian	302,618	6,212
Danish	333,231	11,880
Dutch	437,179	15,607
French	1,089,540	28,631
German	1,784,725	55,217
Italian	771,759	41,479
Norwegian	1,669,087	100,662
Russian	476,672	11,230
Spanish	547,358	12,215
Swedish	498,004	14,757

During 1894, the gross reduction in the effective mercantile marine of the world amounted to 1,154 vessels of 708,971 tons, excluding all vessels of less than 100 tons. Of this total, 281 vessels of 329,929 tons were steamers, and 873 of 379,042 tons were sailing vessels.

The American Line steamship "St. Louis," on Sept. 1, broke her own record in the voyage from Southampton to New York by going over a course of 3,055 knots at an hourly average of 19.11 knots, under unfavorable conditions of weather. The "New York," of the same line, in September, 1894, made 3,047 knots at the average speed of 20.15 knots per hour. But the "St. Louis" is regularly increasing her record, and the owners believe that before long she will set a new record for all ocean liners.

The new White Star steamer "Georgic," said to be the largest cargo steamer afloat, arrived at New York on her first voyage out from Liverpool on Aug. 27. She was built by Harland & Wolff, of Belfast. Her dimensions are: length, 558 ft.; breadth, 60 ft.; depth, 40 ft.; draft, when fully loaded, 28 ft. 6 ins.; tonnage, 10,007 tons gross, 6,570 net; displacement, 20,166 tons; dead weight carrying capacity, estimated at 12,320 tons. She is driven by twin screws turned by two triple expansion engines of 4,500 I. HP., and her speed is 13 to 13½ knots. The vessel has a refrigerating chamber which will accommodate 1,000 carcases of beef and can carry over 900 head of live cattle.

Philadelphia's harbor is to be improved by the city of Philadelphia by the removal of certain rocks and other obstructions in the Delaware and Schuylkill rivers. The work will be done under the direction of the Director of Public Works and $225,000 is available for this purpose. The immediate cause of this work is the fact that the state of Pennsylvania has failed to appropriate the sum required and steamers of deep draft are leaving the harbor for New York, and the city's commercial interests are suffering as a consequence.

The most serious railway accident of the week was the collapse of a small bridge under a derailed train on the Kansas City, Fort Scott & Memphis R. R., near Monmouth, Kan., Sept. 7. A passenger train was approaching the bridge over Indian Creek when an axle on the baggage car broke, derailing the car and this car struck the side of the bridge, which collapsed. The engine and baggage car went into the creek and the first passenger coach fell on the baggage car, so that the passengers were easily rescued. About 12 persons were injured.

A grade crossing collision between a Long Island R. R. passenger train and a fire department truck occurred Aug. 29 at the crossing of Vesta and Liberty Aves., Brooklyn, N. Y. The gateman saw the fire engine coming, and ran down the track with his red lantern to stop the approaching train, as fire apparatus has the right of way at crossings. It is said that the engineman had plenty of time to stop, but did not heed the signal, and the train smashed the truck and ran over one of the firemen.

Several bridges and lengths of track on the Mexican National Ry. were washed out by the floods from heavy storms on Sept. 1.

An explosion of dynamite at the river improvement work at Specht's Ferry, Ia., on Sept. 8, killed five persons and seriously injured three more. The dynamite was stored in a shanty, and a son of the foreman was shooting at a target near the place, though ordered not to do so, and it is supposed that a stray shot struck the building.

A reducer on a 36-in. water main at the corner of Duane St. and Bellevue Ave., Syracuse, N. Y., was blown out during the night of Sept. 2, and the flood of water tore up the street and flooded houses and cellars. The main is a new one and the contractors were digging to locate a leak at this point, the water from which was bubbling up to the surface of the street.

A fire in the timbers of the Osceola copper mine, at Houghton, Mich., on Sept. 7, caused the death of about 35 men. A force of rescuers were driven back by the gases, and the miners had to be abandoned to their fate. The shafts of the mine have been closed in order to smother the fire.

A simple interlocking system for grade crossings of main lines by small lines or electric railways consists in equipping the less important track with derailing switches standing normally open, these derails being interlocked with the signals of the main track. In a system on this plan, installed by the Hall Signal Co. at a crossing of the St. Louis, Keokuk & Northwestern R. R. by a small single track line, the latter track is fitted with derailing switches, which must be held closed by a trainman to allow the train to reach the crossing. When a train on either main track reaches a point half a mile ahead of the Hall automatic signal governing the block in which the crossing is located, it causes an indicator to be displayed at the derailing switches, giving warning of the approach of a train having the right of way. If the train on the single track finds that no main track train is approaching the trainman closes the derailing switch, and thereby sets the main track block signals at danger, thus showing that the crossing is occupied.

The stand-pipe at Grand Rapids, Mich., was inspected recently by the city engineer and a committee of the Board of Works, and the committee recommended that the stand-pipe should be cleaned of rust on the inside and painted with a graphite paint. The board ordered this work done, but Mr. J. L. McVean, of the committee, has presented a minority report recommending that the stand-pipe should be abandoned, as he believes that the rust has materially weakened the structure and doubts whether the action of the rust can be stopped.

The grade-crossing of the Baltimore & Potomac R.R. and the electric tracks of the Metropolitan Ry. Co. at 4½ St., Washington, D. C., are the subject of a controversy, the latter company having asked the District Commissioners to issue an order requiring the Baltimore & Potomac R. R. to stop all trains before reaching the crossing. The only ground for this claim is that Congress compelled the company to adopt electric traction. While such crossings should certainly be protected by interlocking safety appliances, there seems to be no good reason for requiring the steam railway company to stop every train. The line of heavy traffic should have right of way in all cases.

The electric locomotive of the Baltimore Belt R. R. is said to have attained a speed of 61 miles per hour during a test made on Sept. 6, this speed being attained with the engine running light on an up-grade. This locomotive is now in regular service, and its average speed in hauling freight trains is 15 miles per hour.

The first completed section of the Chicago Drainage Canal is Section 10, and on Sept. 3 a stone tablet recording this fact was attached to the side of the rock cut near Lemont. Work on this section was commenced Sept. 3, 1892. The length of the section is 6,000 ft., and the excavation amounted to 1,199,546 cu. yds. of rock and 62,083 cu. yds. of glacial drift. The contractors were Edward Smith & Co.

The informal ballot on modified recommended practice in the location of grab-irons or handholds taken by the Master Car Builders' Association has resulted in 653 votes in favor of and 320 votes in opposition to the proposed practice. The latter votes included 180 in unqualified opposition and 140 qualified. Of the qualified votes cast against the proposition, 85 objected to the location of handholds underneath the end sills, and 51 objected to the handholds in the higher locations, on the ends of box and stock cars. As there are 1,477 possible votes in the Association, it is impossible to say from this test ballot what modifications can be adopted in 1896 in the recommended practice for handholds, although more than two-thirds of the votes just cast were in favor of the proposed modifications.

CHICAGO MAIN DRAINAGE CHANNEL.

XVII.

Section 10.

As on Section 9, the excavation on this section was almost entirely solid rock, there being only a thin layer of glacial drift covering the rock surface. Exactly stated, there were 62,083 cu. yds. of glacial drift, and 1,199,546 cu. yds. of solid rock excavation on the section, and this material was taken out at 25 cts. and 80 cts. per cu. yd., respectively. The contractors are E. D. Smith & Co., who were awarded the work July 13, 1892.

FIG. 77. VIEW SHOWING METHOD OF ROCK EXCAVATION BY DUMP CARS AND CABLE INCLINES, SECTION 10.

From its beginning the work has been signalized by good management and freedom from trouble, and it is in large measure owing to this that this section of the canal is the first to be completed. On Sept. 3 the last rock was removed from this section. The event was marked by appropriate ceremonies, and a tablet recording the date was fixed to the rock wall near Lemont.

In loosening the rock the same methods were employed on this section as on those preceding; that is, channeling, drilling, and blasting. Sullivan channelers and Rand drills were used, and the air for the drills was furnished by two 18 × 30-in. duplex Rand compressors. These compressors were located near the center of the section and pumped into two 15-ft. × 45-in. receivers, from which a 6-in. pipe ran in opposite directions up and down the section. Steam was supplied by four 16-ft. × 66-in. boilers. The plant was rated at 28 drills capacity. As a usual thing the holes were put about 12 ft. apart, and about the same distance back from the face of a single row across the channel.

After the rock is broken it is transferred to the spoil bank by one of two methods. For the upper lift, and also to some extent for the lower lifts, tram-cars hauled up cable inclines have been used. Fig. 77 shows one of these hoists on the top lift with the cars arranged along the working face for loading. The tracks are arranged in a loop, as the illustration clearly indicates, so that the empty cars take the outside track in descending, and pass around the curve ready to take the place of the loaded cars without delay. Twelve cars are used, and they are hauled away, two at a time, as fast as loaded. Generally 40 men were worked on the face loading, and four on the spoil bank dumping and switching back the cars. No very accurate figures are available as to the capacity of this system, but it was estimated that the average output was about 3 cu. yds. per man per 10-hour day.

The second method of conveying the rock out of the pit is by the well-known Brown cantilever crane, manufactured by the Brown Hoisting & Conveying Machine Co., of Cleveland, O., especially for this work. The cantilever crane had been built by the above company for conveying coal, ore, pig iron, and other heavy material for many years, and it was argued that with some modification it could be efficiently applied to the canal work. The work which the machines have done is proof of the soundness of these arguments, for they have far exceeded the requirements specified. When the contractors of different sections agreed to use the cranes, they stated that 225 loads per day, or about 390 cu. yds. of rock in place, would be a more than satisfactory output. In records of work which will be given in this and future articles, it will be seen that the machines have accomplished all they were called upon to do.

Altogether eleven cantilever cranes have been used on the canal—three on Section 10 and eight divided between Sections 11, 12 and 13. As all the machines are practically identical in construction, a description of one on Section 10 will answer for all, but the method of operation and outputs of the different machines will be described in connection with the section on which they work.

Fig. 78 is a plan and elevation of one of the canal cranes, showing its location in respect to the channel and spoil bank when in operation, and Fig. 79 is a view of the same machine, showing a piece of completed rock cut, and the face upon

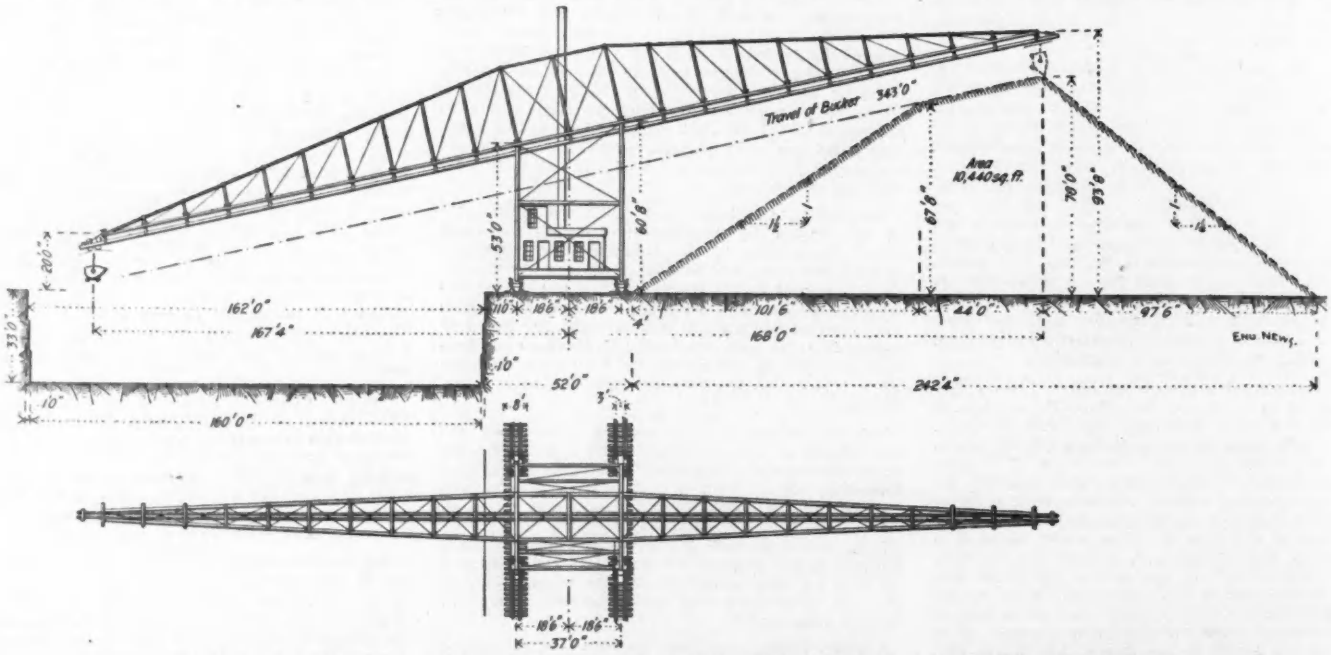


FIG. 78. ELEVATION OF BROWN CANTILEVER CRANE FOR EXCAVATING AND CONVEYING ROCK.
The Brown Hoisting & Conveying Machine Co., Cleveland, O.

which work is being prosecuted. As will be seen from the drawings, the crane consists of two connected cantilevers supported on a tower arranged to travel on a track on the berm. The cantilever trusses have an inclination of 12½°, so that one arm of the crane projects downward over the

channel, while the other projects upward over the spoil bank. From end to end the trusses are 355 ft. long generally, but in some machines this length is 353 ft. In all machines the height is sufficient to allow an 80-ft. spoil bank.

Along the line of the lower chords of the trusses is a track on which a carriage or trolley travels, as shown by the elevation, Fig. 78. This carriage is operated by a cable from a 10½ × 12-in. hoisting engine placed on the tower car. The same engine also operates the cable for hoisting the skip, and the machinery for propelling the crane along the canal berm. All the movements of the machinery are controlled by three levers, one of which makes the connections to hoist the bucket, one moves the carriage, and the other actuates the propelling machinery. The travel of the skip is 343 ft., and it can be dumped by an automatic arrangement at any point in its travel. In moving along the berm the speed can be varied from 150 ft. to 400 ft. per minute. The weight of the entire machine is 150 tons, and its cost about $28,000.

FIG. 79. VIEW OF BROWN CANTILEVER CRANE AND WORKING FACE IN ROCK EXCAVATION.

Fig. 80 is a view of the carriage,which is a somewhat complicated but unusually handsome piece of mechanism. The exact method of the operation of this carriage in conveying and dumping the skip is not given out, but in a general way it is as follows: The fall block to which the bail of the skip is attached has two hubs, or, more exactly, the axle of the fall block sheave projects on each side. When the fall block is hoisted these hubs strike the pieces A and B on the inclined lower edge and swing them forward, allowing the hubs to pass up into the opening, clearly shown by the illustration. Here the hubs of the fall block are caught and locked,so that when the hoisting rope is slackened the carriage supports the full weight of the fall block and its load. In this condition the carriage is hauled along the track on which it runs on the track wheels C, D, E and F, shown at the top corners of the carriage. It will be noticed that the upper right-hand track wheel has been removed, and is shown detached at the lower right-hand corner of the engraving. When in its progress along the track the carriage reaches the dumping trip, the lever G is actuated in such a manner that the catch locking the bail to the skip is loosened, and the bucket revolves on its trunnions, allowing the load to spill out. Other parts of the carriage which may be explained briefly, but whose operation in detail cannot be given, are as follows: H, hoisting rope sheaves; I, K, L, barrels containing springs to return parts to their normal positions after the bucket is dumped; M, guides for ropes, and N, bumper.

The skip is made of steel plate, and has a trunnion on each side to which the bail is hooked. Of course, only one bail is used, which is fastened to the fall block and hooked and unhooked from the skips as they are loaded and emptied. Each skip has a capacity of 75 cu. ft. water measure, or about 1¾ cu. yds. of rock in place.

The method of operating the cranes is practically the same on all sections, although, of course, the disposition of the labor force and special details differ on different sections. These differences will be described in their proper place, but it may be stated here that in all cases a face extending transversely across the channel is worked by blasting down the rock and loading it by hand into the skips, which are strung along the foot of the face. A skip, as soon as loaded, is hoisted, conveyed to the spoil bank, dumped and returned to its place in the pit, and another taken and returned, this operation going on as continuously as the loading of the skips will permit. Since the crane will handle from 25 to 30 skips per hour, it will be seen that it will have to do more or less waiting for the skips to be loaded, the amount of delay depending upon the character of the rock, the weather, the number and efficiency of the laborers, etc. Such figures of delays as are available will be given in a future article, where the controlling conditions in each particular case are described.

Returning now to the cantilever crane work on Section 10, we are able to give some very exact figures of the labor force and output. In submitting these figures the contractors wrote as follows:

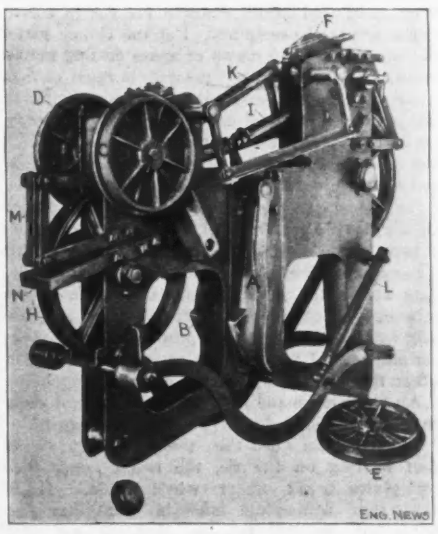


Fig. 80. Carriage for Brown Cantilever Crane.

The following figures are the averages per 10-hour shift for one cantilever crane worked on Section 10 for the month of March, 1895. The crane worked one 10-hour shift per day. We have had some months better than this and some not so good, but this is a good average for machines working on the lower lift.

The figures given were as follows:

Number of shifts in month	25
Total cubic yards excavated	13,014
Number of skips worked on each face	9
Number of laborers worked on each face	48
Number foremen worked on each face	2
Wages of laborers, per hour, cts.	15
Wages of foreman, per hour, cts.	30
Wages of crane engineers, per month	$75
Wages of crane firemen, per month	60
Tons of coal burned, per shift	2 to 2½
Cost of coal, per ton on siding	$1.75
Average skip-load, cu. yds. in place	1.6

The average output per 10-hour shift, according to these figures, was 520.4 cu. yds., or 10.4 cu. yds. per man worked on the face per 10-hour shift.

According to the records of the Division Engineer, Mr. C. L. Harrison, the outputs of the three cranes worked for six months, February to July, 1895, inclusive, were as follows.

Month.	No. worked. Cranes.	Shifts.	Total excavated, cu. yds.	Cu. yds. excav't'd per shift.
February, 1895	3	50	25,500	510.0
March, "	3	76	32,300	425.0
April, "	3	69	37,400	542.0
May, "	3	78	38,500	493.6
June, "	3	72	35,400	491.6
July, "	3	76	36,800	484.2

Lumping together the work for the entire six months, it is found that three cranes excavated 205,900 cu. yds. of rock in 421 10-hour shifts, or an average of 489 cu. yds. per crane per shift. Assuming that an average of 50 laborers and foremen were worked on each face, the output per man per 10-hour shift for the six months was 9.98 cu. yds. These figures are, of course, far more valuable as a basis for estimating the efficiency of the cranes than those covering only one machine operating for a single month. In a future article still more complete records of cantilever work will be given.

For aid in preparing this article we are indebted to Mr. Wm. M. Christie, Engineer, Qualey Cons. Co., and to the contractors, as well as to the engineers of the Sanitary District.

A NEW METHOD FOR SECURING FOUNDATIONS.

Mr. Robert L. Harris, M. Am. Soc. C. E., of New York city, has recently secured a patent (No. 538,073) on a new method and apparatus for securing foundations in mud, sand, etc. He uses a caisson with a slightly projecting cutting edge, but with a closed bottom. Through this bottom deck are passed series of circulating pipes, made up of a smaller pipe, usually terminating in a bend of 90°, for passing water under pressure, and a larger pipe near by, through which the water, sand, etc., flow to the surface, the flow being assisted, if necessary, by a suction pump attached to the pipe.

The object of the invention is to excavate and remove the material beneath the bottom deck without the necessity of sending men into the caisson; and when the desired depth has been secured, cementing material may be filled in beneath through the same pipes.

The small forcing pipes may have various forms of terminals, with nozzles either stationary or adapted to rotation, so as to project the issuing jets of water upon the material to be softened and removed. Where logs, boulders or other obstructions are liable to be met with, Mr. Harris proposes to make the metal shell of the caisson double and divide it into separate vertical chambers. Upon the inclined inner surfaces of the cutting edge suitable doors or flaps would be provided, hinged at the upper ends and secured by hooks. These doors would usually remain shut, and the caisson chambers could be filled with water ballast to assist in sinking. If an obstruction under the edge is met with, this would first be located by a rod or other appliance; the particular chamber covering it would then be closed, the door in the cutting edge unhooked, and water would be forced in until the door was opened by the outward pressure of the water; then suitable cutting or drilling tools would be introduced for cutting or breaking up the obstructing object.

Ordinarily logs, boulders, etc., occurring under the caisson would be forced down with it. In cases where the material penetrated is of a binding character, like quicksand, and would thus interfere with sinking the caisson, the up-take pipes may be closed and the water from the pressure pipes will be forced to escape under the cutting edges and up between the outer shell of the caisson and the adjacent material.

Mr. Harris believes this method to be especially available for founding lighthouses, bridge piers and similar structures where a great depth of foundation is often necessary. He thinks it would also be useful in founding high buildings.

COMPARATIVE MERITS OF METAL TIE-PLATES.

A number of years ago, when the railway clubs were organizations of much less importance and lower standing than is the case at the present day, a not uncommon plan for furnishing instruction and entertainment for an evening was to invite all the representatives of the manufacturers making a certain article to appear before the club and explain the merits of their own goods, and incidentally the faults of those of their rivals. Whatever the defects which led to the abandonment of this type of discussion, there is no doubt that it often furnished exceedingly animated verbal combats, and the listener who was competent to sift the true from the false was often able to gain no small amount of valuable information.

This type of discussion still survives, it appears, in the Northwest Railway Club, which has its headquarters at St. Paul. At a recent meeting of the club the representatives of three varieties of metal tie-plates devoted an evening to the discussion of the merits and demerits of their respective devices, and from the printed report of this discussion we have been able to extract considerable matter of technical interest.

The three plates represented were the Goldie plate (Dilworth & Porter, Pittsburg, Pa.), having a rib on the upper side and a chisel-edged claw or spur at each corner, cutting across the grain of the tie; the Servis plate (Q. & C. Co., Chicago, Ill.), with flat top and two or three bottom flanges lying lengthwise of the tie; and the Churchward or C. A. C. plate (Standard Railway Equipment Co., New York, N. Y.), having a rib on the upper side, and a series of wedge-shaped teeth on the bottom, the teeth cutting across the grain of the tie. Apart from the general and introductory remarks, the discussion may be considered with regard to the following particulars: 1, Rib and flat top; 2, Width of plate; 3, Thickness of plate; 4, Bottom ribs and teeth; 5, Shimming.

Rib and Flat Top.—The makers of plates having ribs on top to engage with the outer edge of the rail base claim that one of the important functions of the tie-plate is to relieve the spike from the outward thrust of the rail and the wear due to abrasion by the edge of the rail base, leaving it to merely hold the rail down upon the plate. This certainly seems reasonable, especially when we consider how inefficient the spike is in itself as a fastening for rails carrying heavy traffic. When once the compression of the wood of the tie or the vertical motion of the rail have given ever so slight a play between the rail base and the spike head, then the abrasion of the neck of the spike will at once commence. In such a case, if the tie-plate has a rib the abrasion will be distributed over the whole length of the rib, instead of being concentrated on the narrow neck of the spike. On the other hand, it is claimed that the Servis flat-top plate (which has been used more extensively and for a longer time than any other plate in this country) has been found entirely satisfactory in this respect, and that little or no "necking" of the spikes had been found, even on sharp curves, provided that the rail base is the full width between the spike holes of the plate and that old "necked" spikes are not redriven with the plate. In other words, there has been no trouble where full contact and an absence of play are insured in the first place, as, of course, they should be in good tracklaying. As some railways, however, were found to have decided opinions in favor of a rib, the makers designed a plate of this form, but differing radically from others by having the rib at right angles to the rail, and cut away from the width of the rail base. The claim made for this plate (which the makers do not consider superior to the flat-top plate) is that any outward movement of the rail at one point must be accompanied by a corresponding inward movement at another, and that therefore if it is necessary to hold the rail at all, it must be held on both sides to get the best results.

Width of Plate.—While one maker advocates narrow plates, so as to concentrate the load near the middle of the tie, and thus approximate to an ideal bearing narrow on top and wide at the bottom, another maker claims that such plates increase the distance between the rail supports, thus reducing the stiffness of the track, especially with light rails. The former maker then states that in actual service tie-plates 3¾ ins. wide gave better results than others of the same make 6 ins. wide, and that one road has abandoned 6-in. plates in favor of 5-in. plates, while attention is also called to the rocking of wide ties. Early experiments with plates the full width of the ties showed a resultant rocking movement of the ties, due apparently to the interrupted wave motion of the rail. On the other hand, the disadvantages of increasing the span between bearings are very evident, especially with light rails, and it is a question whether a greater number of narrower ties might not be used to advantage with the narrow plates.

Thickness of Plates.—Here again diametrically opposite views are maintained. For the thin plates it is claimed that the thinner the plate can be made (as long as it is able to resist buckling), the better it will be, as it will give a more perfect union with the tie than a thick plate. In the case of the Servis plate, which is stiffened against buckling by its longitudinal bottom flanges, the thickness is 3-16-in., which has been found satisfactory, provided, of course, the plates are properly put on, so as to have a uniform bearing. As neither the Goldie nor Churchward plates have this stiffened shape, they must rely on the thickness of the plate to prevent buckling, and for the latter a thickness of ½ in. is recommended, while the former is made ¼ in. and ⅜ in. thick (the latter being recommended). As to the wear of the plate by the rail, experience shows that this is very slight, so that great thickness is not required to resist such wear, and a thin plate, which will not buckle and will not work under the traffic so as to injure the tie, would therefore appear to be as efficient as, and more economical than, a thick and heavy plate.

Bottom Ribs and Teeth.—In respect to the methods by which the plates are attached to the ties, the plates may be divided into two classes: first, those in which the projections are lengthwise with the tie and approximately parallel with the fibers; second, those in which the projections are transverse to the tie and cut across the fibers. Only one of the plates under consideration belongs to the first class, but the long experience with it appears to have substantiated the claims made for it, both in security of grip and in protection of the wood of the tie, and the objection that the flanges will cause checking and cracking and afford chances for rot to set in does not seem to be sustained. For the Goldie plate, with four chisel-edged claws or spurs cutting across the grain, it is claimed that the grip is equal to that of four good spikes, and that any lateral motion of the plate is absolutely prevented, while the sharp edges and narrow faces of the spurs prevent serious injury or crushing of the fibers. To this it is objected that outward thrust on the plate will force out the fibers cut by the spur, but this does not seem very probable, except, perhaps, in very soft and poor ties. For the Churchward plate, with two rows of beveled teeth or lugs on the underside, cutting across the grain, it is claimed that these lugs wedge or compress the fibers so as to close tightly against the lugs, thus preventing any cracking or entrance of water, but it seems to be doubtful whether this method will give a good hold upon the tie. An objection made to plates of the second class is that it is difficult to drive the projections in so that the bottom of the plate will have a perfect bearing on the tie, the result being that many plates break under wheel loads. It is certain that a tie-plate must in some way be self-attached to the tie, so that it will not move under the traffic, but it appears doubtful whether any provision to prevent such a plate from moving lengthwise on the tie is necessary. In any case, the plate should be properly bedded upon the tie in the first place, and not left for the traffic to drive it home, as the traffic will not do this efficiently, and meanwhile there is a liability of gravel, ballast, etc., getting under the plate.

Shimming.—A question very often put in regard to the use of tie-plates is as to the method of shimming on ties so equipped. In the discussion at St. Paul, the representative of one plate advised that the plate should be removed, but the representative of another plate advised the use of shims between the plate and the rail, the shims being bored to correspond with the spike holes in the plates. Considering the difficulty of removing a well-seated plate, and the injury resulting to the tie, as well as the impossibility of getting the plate as well fixed again after the shimming has been withdrawn, the latter method is certainly the better, and has been tried in practice with satisfactory results. Where shims more than 1½ ins. thick are required, a piece of plank should be spiked to the tie and the shims placed upon it, while, if traffic is very heavy, a second tie-plate may be placed on top of the shims. The tie-plate is intended to be a permanent part of the tie, and should never be removed to allow for the temporary expedient of shimming.

WATER POWER DEVELOPMENT AT THE GREAT FALLS OF THE POTOMAC.

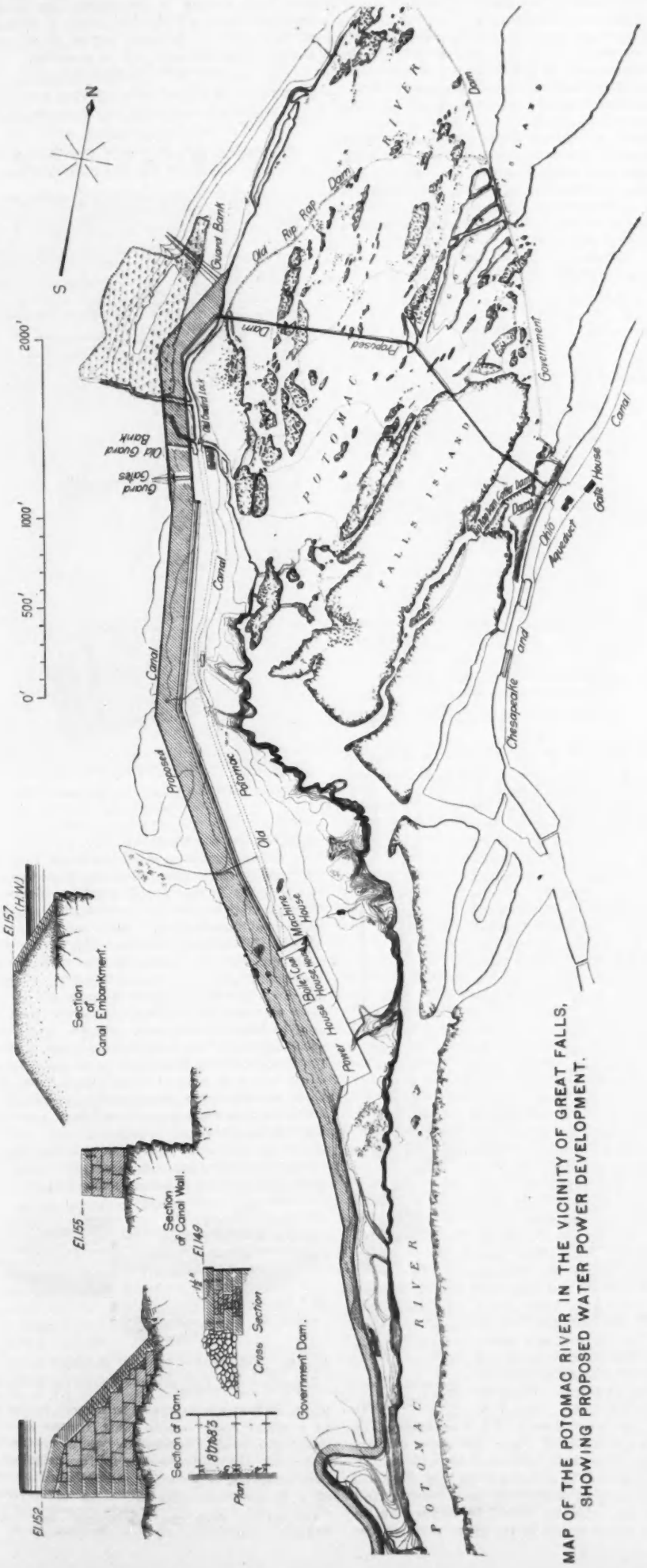
The Great Falls of the Potomac River are about 15 miles above the city of Washington, D. C. At this point the river is nearly half a mile wide. About one mile further upstream is the dam across the Potomac, built by the U. S. Engineers, for diverting water into the aqueduct supplying Washington. The crest of this dam is about 149 ft. above tide at the Washington Navy Yard, and the total fall to smooth water in time of low water in the river is 80 ft. Above the falls the river has a width of about 2,500 ft., and below it flows in a narrow, deep gorge, with nearly vertical walls of gneiss rock, about 60 ft. high, and a general width of about 200 ft. at low water for a distance of about two miles.

The power to be derived from the water not used for the Washington supply is now to be utilized by the Great Falls Power Co., incorporated under a Virginia charter on March 3, 1894. Mr. Paul Butler is the President, Mr. John B. Cotton is Secretary and Mr. Adelbert Ames is the Treasurer. The Chief Engineer is Mr. Joseph P. Frizell, M. Am. Soc. C. E., of Boston, who has had an extended experience in hydraulic engineering, and from his report on the project the following general description of the work to be performed is gleaned. It should be stated, however, that since this report was made press accounts would lead us to believe that there has been a change in the officers of the company, though reports are too conflicting to state just what these changes are. The following report, however, will still generally describe the enterprise:

The drainage area of the Potomac above Great Falls is 11,476 sq. miles, an area more than three times that of the Merrimac at Lowell, and exceeding by nearly 50% that of the Connecticut at Holyoke, according to figures given by Prof. George F. Swain in his report on the Water Power of the United States for the 1880 Census. The same authority gives the annual rainfall at 44 ins. in the lower part of the Potomac watershed, and 38 ins. in the upper part. In estimating the flow of the stream, the records kept at the government dam are the best guide. This dam was completed in 1886, and from the daily gage record it appears that the flow of the stream has not fallen below 2,000 cu. ft. per second for more than 30 days in the intervening seven years; and it has never fallen below 1,500 cu. ft. in the entire period. It falls below 5,000 cu. ft. per second less than 90 days in the year, as an average. The lowest recorded flow is 1,069 cu. ft. in 1856.

This river water is already used to some extent by the Chesapeake & Ohio Canal; but Mr. Frizell computes that the demand from this source only amounts to 8 cu. ft. per second for the entire day, and he regards 15 cu. ft. as an exceedingly liberal allowance for the canal. The Washington Aqueduct consumes more water, and it is calculated that with the present height of dam it is possible to draw through the aqueduct 120 cu. ft. per second, or nearly 78,000,000 gallons per day. Should the dam be raised, as is contemplated, high enough to fill the aqueduct to the crown of the arch, the draft might be increased to 153½ cu. ft. per second, or nearly 100,000,000 per day. This last-named quantity, with a fall of 80 ft., would represent 1,091 HP.

Mr. Frizell estimates that the company can develop a water power here to the extent of 1,500 cu. ft. per second, or 10,000 HP., with very little chance of interruption. But he proposes to adopt the works for the consumption of 5,000 cu. ft. per second, or the equivalent of 35,000 HP. This quantity can be relied upon for nine months in the



MAP OF THE POTOMAC RIVER IN THE VICINITY OF GREAT FALLS, SHOWING PROPOSED WATER POWER DEVELOPMENT.

year, and for the other three months he would supplement the water by steam power. In fact, gage readings for the years 1886-1892, inclusive, show that except on an average of 106 days in the year, 7,500 cu. ft. per second are available, or the equivalent of 50,000 HP. This 106 days represents the time in each year in which steam power would have to be used in the development of 50,000 HP.

The Great Falls Manufacturing Co. owns the Virginia shore of the Potomac from a point near the dam 2½ miles downstream, and including 876 acres on that side. It also owns Conn's Island, and has joint rights with the United States in Falls Island and the Maryland shore. The building of the government dam has also diverted water from the Virginia to the Maryland side of the river, without deriving any especial benefit from this diversion. As the company then owned and still owns Conn's Island, it claims that this diversion is an injury, and negotiations are in progress for an adjustment of the matter.

The works proposed by the company include a dam and gate and power houses, with all equipment necessary. It is proposed to raise the government dam 3 ft., which would back up the water about two miles and provide in this 3 ft. of extra depth a pondage of about 600,000,000 cu. ft., or a flow of 2,000 cu. ft. per second for a little over eight hours. As this drawing down of the lake above the dam would probably not be satisfactory to the United States authorities, the present plan contemplates a new dam, which would hold the water at not less than 3 ft. nor more than 6 ft. above the present dam. This would back the water up about 3 miles, and give a pondage sufficient to hold 5,000 cu. ft. per second for five or six hours. Pondage is of vital importance in such an enterprise on account of the varying demand for power at different hours of the day. The fall would be 82 to 83 ft.; on which, with wheels of ordinary construction, 1 cu. ft. per second amount to fully 7 HP. This dam would be built of dressed stone on the downstream face and cap, and be raised 3 ft. above the present dam, with 3 ft. flashboards above that. These boards would be supported by iron pins let into holes in the cap-stones, with the idea that in heavy floods, or under the action of ice and driftwood, the pins would bend and allow the boards to be carried away. The form of the dam is similar to that on the Merrimac at Lowell. The length of the dam proper would be about 2,600 ft., with a continuation of the canal wall for 800 ft. more, and considerable earth embankment.

The power station is planned with the especial purpose of supplying Washington and Baltimore with electric current for lighting purposes and for operating the electric railways of Washington. Mr. Frizell estimates this demand as equal to 8,600 HP. for Washington and 7,200 HP. for Baltimore, requiring the establishment of a power plant at Great Falls capable of utilizing 12,000 HP. for the one city and 10,000 HP. for the other, or 22,000 HP. in all. This plant would call for 1,420 cu. ft. of water per second, which he believes can be depended upon for all time.

The power house would be 500 ft. long, with two raceways along the center cut to a depth of 16 ft. below low-water level. The wheels will run on horizontal axles, for the greater simplicity of driving connections. The generators will be arranged in pairs, with two 500-K-W. generators on each shaft, though two or more shafts may be connected when desired. Each shaft has three pulleys—two at the ends for driving from the wheels, and one in the center, to be driven by a steam engine when steam may be required. Each water-wheel would have a capacity of 1,500 HP., and 16 wheels are included in the estimate, with room for several more.

The report gives the estimate of cost in detail, but this may be summarized as follows:

Dam	$150,000
Gate house	50,000
Canal	127,000
Power house, wheels and races	522,000
Electric plant	1,567,600
Administration and engineering, 5%	120,830
Total	$2,537,430

The annual revenue expected from Washington is

$297,250, and from Baltimore, $440,000; a total of $737,250. The annual charge for maintenance, renewals, depreciation and taxes is figured at $234,170, leaving a probable net income of $503,079. Another estimate for supplying a maximum of 3,600 HP. to Washington alone, requiring the development of 5,000 HP. at Great Falls, amounts to for extension as demanded.

Since Mr. Frizell's report was presented, a shaft has been sunk to a depth of 70 ft. on the site of the proposed power house, to ascertain the character of the rock, and also to form part of the wheel-pit excavation. The result was very satisfactory, showing the rock to be firm and impervious.

A DIAGRAM FOR DETERMINING ECONOMICAL DEPTH OF GIRDERS.

By Wm. G. Kirchoffer.*

This diagram was prepared especially for use in the design of bridge floor beams, stringers, etc., and plate girder bridges, but it may be used for

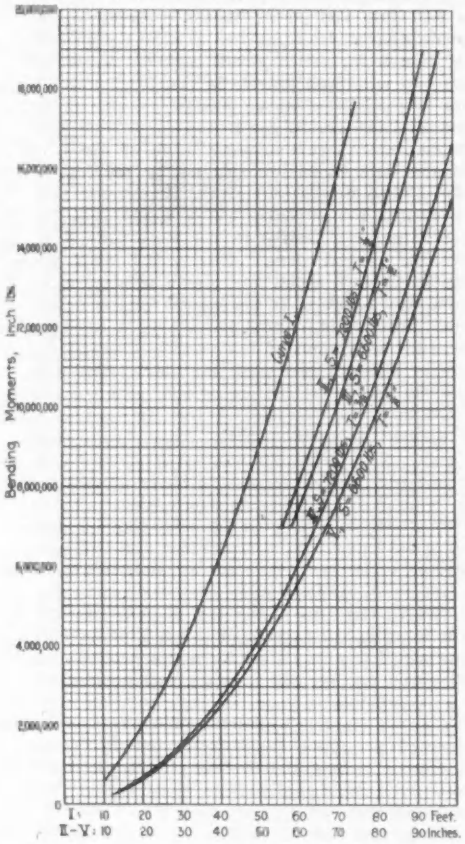


Diagram for Finding Economic Depth of Plate Girders.

(Crrves II. to V. are plotted from the formula: Economic depth $= 1.27\sqrt{\frac{m}{s\,t}}$. Curve I. gives max. bending moment on girders for Cooper's Extra Heavy "A" wheel loads on one rail.)

any work which the limits of the diagram will permit.

The depth of the girder in inches is plotted on the horizontal lines as abscissas of the curve, and maximum moments in inch-pounds are plotted on the vertical lines as ordinates. Curves II., III., IV. and V are parabolas from the equation:

$$\text{Economic depth} = 1.27\sqrt{\frac{m}{s\,t}},$$

which is derived in Prof. J. B. Johnson's "Modern Framed Structures" as follows:

The moment of resistance of the web plate being neglected,

Let m = maximum moment on girder in inch-pounds.
" x = depth of girder in inches.
" y = weight of girder in pounds.
" s = allowable fiber stress per square inch on gross area.
Let t = thickness of web plate in inches.
" l = length of girder in feet.

As the curve of maximum bending moments approximates a parabola, the cross-section of the flanges should vary as the ordinates to a parabola whose middle ordinate represents the area of flange at the center of girder, the axis of the parabola being vertical.

The area of this parabola = ⅔ the center ordinate × the length of girder; but as the flange angles extend the full length of the girder, which would make the cross-sections near the end larger than the parabola would make them, the coefficient ⅔ is changed to 8-10. Then we have the equation for the weight of girder:

$$y = \frac{10}{3}\,l\,t\,x + 2\cdot\frac{8}{10}\cdot\frac{m}{x\,s}\cdot\frac{10}{3}\,l.$$

Then to find the value of x to make y a minimum,

$$\frac{dy}{dx} = \frac{10}{3}\,l\,t - 1.6\,\frac{m}{s}\cdot\frac{10}{3}\,l\cdot\frac{1}{x^2} = 0,$$

solving for x we have

$$x = 1.27\sqrt{\frac{m}{s\,t}}.$$

I have placed four curves upon this diagram to show what effect a change in s or t makes upon the depth.

To find the economical depth by this diagram, compute the maximum moment in inch-pounds which comes upon the girder in question. From this value in the vertical line at the left-hand follow on the horizontal line to the curve whose values of s and t are those assumed for this particular case; from this point follow vertical line to the bottom of the diagram, where the depth may be read off in inches. Curve I. is for finding bending moments from wheel-loads when the length of girder is known. Length in feet is plotted on horizontal lines, moments on vertical lines.

* University of Wisconsin, Madison, Wis.

THE LIDGERWOOD TRAVELING CABLEWAY.

The development of the Lidgerwood traveling cableway, with its aerial dumping devices and traveling towers, to adapt it to the economical excavation of earth and rock, was quite fully described in our issue of July 25, 1895, and in succeeding issues much information has been given regarding the efficiency of this machine in excavating rock on the Chicago Drainage Channel. Through the courtesy of the Lidgerwood Mfg. Co., of New York, N. Y., we reproduce the accompanying cuts from their forthcoming catalogue. These cuts illustrate several features of the construction and operation of the traveling cableway, which have not heretofore been published.

Fig 1. Sketch Showing Manner of Chaining Out Large Rocks by Lidgerwood Traveling Cableway

Fig. 1 is a sketch from a photograph, showing the manner in which large rocks are chained together and taken to the spoil bank without using the skip. Fig. 2 is a view of a skipload of excursionists, and gives a very good idea of the size and capacity of the skip used by the cableways on the canal. The view also shows quite clearly the carriage and a number of the fall rope carriers which have been picked up by the carriage horn on its journey. As the carriage makes its return trip these carriers will be distributed along the cable by means of varying-sized buttons on the supporting rope. Fig. 3 is a view of the latest design of button used. The immense importance of these fall rope carriers will be seen when it is considered that if the fall rope were allowed to sag down for any distance, it would simply be impossible to lower the fall block, and the cableway would be inoperative, in addition to which would be the great wear on the rope from chafing on the ground, the danger attending it, etc., all of which make it evident that without a proper fall rope carrier no cableway of any considerable span can be operated.

COMPOUND EXPRESS LOCOMOTIVES FOR THE ST. GOTTHARD RAILWAY.*

(With Inset.)

In order to do away with the helping engines heretofore necessary on the Erstfeld-Chiasso Division of the St. Gotthard Ry., which has some very heavy grades, and at the same time to reduce the schedule time, the management entrusted to the Swiss Locomotive & Machine Works, Winterthur, the design and construction of two experimental locomotives, which, on the Lucerne-Erstfeld Division, should haul 250 tons, and from there on, over the portion of the road where the heaviest grades are found, 120 tons, at express speed. A speed of at least 60 miles an hour on a level was specified. The locomotives were delivered in May of last year. On the trial trip the speed attained was 65¼ miles per hour. On the Erstfeld-Goeschen Division, in a run where the usual schedule time is 52 minutes, from five to seven minutes were gained with a load of 120 tons.

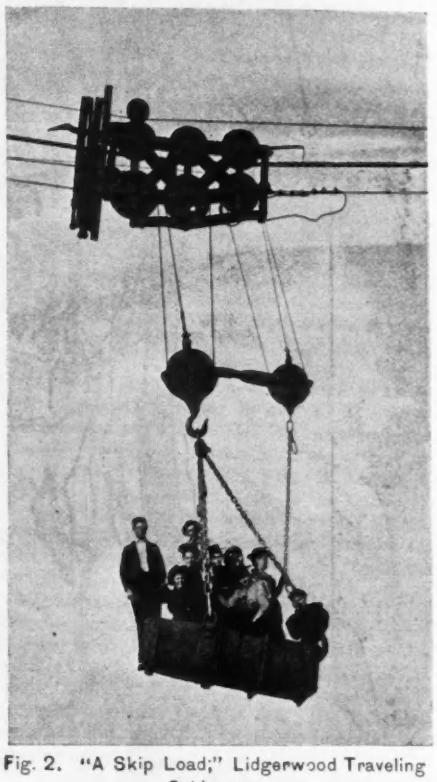


Fig. 2. "A Skip Load;" Lidgerwood Traveling Cableway.

The engines are compound and have a four-wheel leading truck and six coupled drivers. The one shown by the inset has three cylinders and that in the cut has four cylinders. The intercepting valve and receiver are almost identical in both engines, so that one type can be altered to the other at a slight cost. Inside plate frames of 1¼-in. metal are used. Besides the usual cross-connections and the stiffness due to the cylinders and their supports, it is further strengthened by means of a heavy transverse girder or connection be-

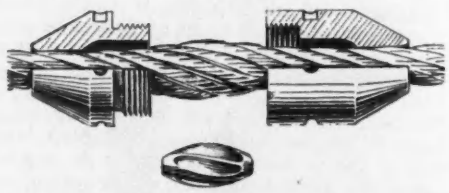


Fig. 3. Details of "Button" for Distributing Fall Rope Carriers, Lidgerwood Traveling Cableway.

* Translated from the "Zeitschrift des Vereines Deutscher Ingenieure," by C. J. Mattison, C. E.

tween the first and second driving axles. Two brackets, fitted with bronze shoes, are riveted to the firebox. These rest upon the frame and support the firebox end of the boiler, and provision is thus made for expansion and contraction. Of the three driving axles the rear one supports the firebox somewhat behind its center. The forward axle is double-cranked and is driven by the inside cylinders, the valve motions of which are controlled by an eccentric secured to this axle. The middle axle is connected to the outside cylinders, whose valves are controlled by Heusinger valve motions driven from return cranks.

The angle of the cranks in the three-cylinder engine is 120°, in the four-cylinder, 135°. Spiral springs of a square section are used instead of elliptic, as customary, with a view to avoiding the frequent breakage common to the latter variety. Each wheel is loaded individually; that is, there are no equalizing levers. The leading truck is so arranged as to allow a slight lateral motion as well as the usual swiveling one.

The boiler, designed for a working pressure of 200 lbs. per sq. in., is constructed of soft steel of about 54,000 lbs. tensile strength, with an elongation of 28.8%. The barrel plates are 11-16 in. thick. The girth seams are double riveted, and the longitudinal seams have butt joints and cover-plates inside and outside.

The firebox has a length of about 7 ft. 6 ins., and the tube sheet, at the lower end, is inclined towards the rear in order to bring the grates to the desired length. At the same time it is extended downwards to give them the necessary inclination. A small firebrick arch is used to protect the tubes and to secure complete combustion. The smokebox is about 6 ft. long, and a fine mesh screen is used to retain the cinders. A direct-loaded safety valve is placed on the dome, and another on a cast iron nozzle over the firebox. The steam for the whistle, the three injectors, and air-pump for the brakes, the steam gage, and for heating the train, is taken from a small dome within convenient reach of the engineer.

The low-pressure cylinders are placed outside the frame, between the rear wheels of the truck and the leading drivers. The high-pressure cylinders are arranged inside the frame and centrally over the leading truck.

The high and low-pressure cylinders, as well as their valve seats, are given a slight inclination downwards towards the rear. In the four-cylinder engine the high-pressure valve seats are parallel to the axis of the cylinders. In the three-cylinder engine they are inclined downwards and outwards. The steam for the high-pressure cylinders is taken from the dome through a balanced throttle valve. The steam chests of the high and low-pressure cylinders are connected by a receiver 6¼ ins. in diameter, and an intercepting valve is so arranged that exhaust steam from the high-pressure cylinders may pass through the receiver directly to the low-pressure steam chests, or be turned directly into the exhaust pipe, whilst in the latter case, through a second valve, steam is taken direct from the high-pressure steam chests to those of the low-pressure cylinders. The opening is so arranged that the pressure in the receiver is never more than about 142 lbs. per sq. in. in the three-cylinder and 170 lbs. in the four-cylinder engine.

The valves are controlled by means of an auxiliary piston, the opposite side of which may be placed in connection either with live steam or the atmosphere by means of a cock. The intercepting valve may also be placed in such a relation that either the high or low-pressure cylinders may be used alone as a simple engine. In this case the low-pressure cylinders take live steam directly through a special steam pipe. The Heusinger valve motions of the high and low-pressure cylinders may be adjusted separately for cut-off, or may be connected together and operated from the hand-wheel for adjusting the cut-off on the low-pressure cylinders. In this manner any desired grade of cut-off may be obtained.

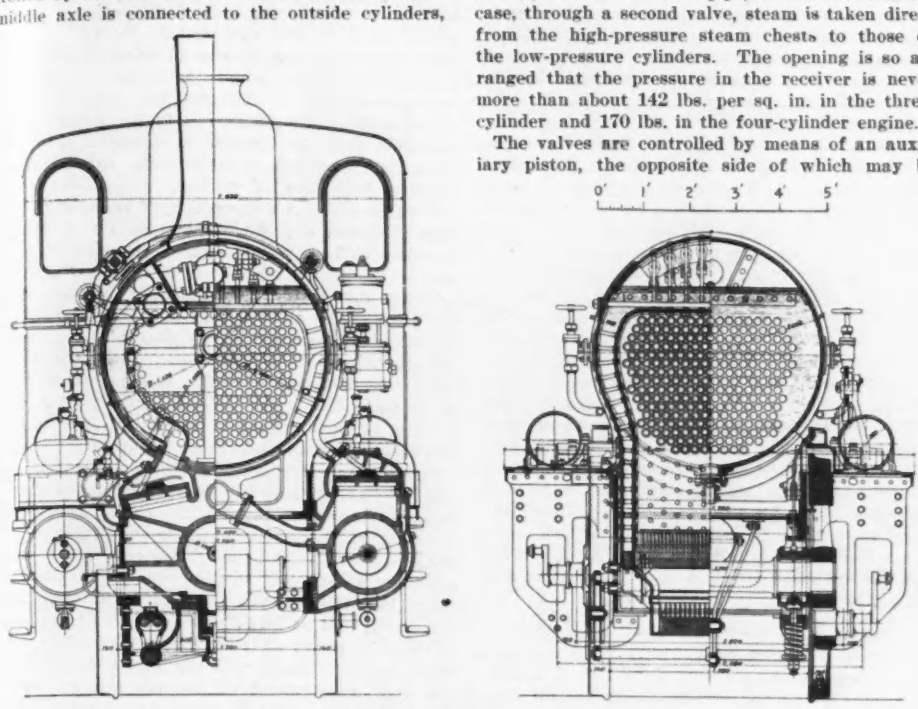
Both locomotives are designed to use the Le-chatelier water-brake when desired. A valve is placed in the exhaust nozzle, by means of which the latter may be closed, and at the same time communication opened between the atmosphere and the low-pressure steam chests. Water from the boiler is injected into the latter to prevent running dry and cutting, and the steam pressure is regulated by means of a valve, so that the braking power may be controlled.

The tender is carried by three axles, and has a capacity of 15 cu. m. of water and 5 tons of coal. The locomotives are fitted with double Westinghouse brakes on the two rear drivers and the tender, and with Brueggemann's apparatus for sanding the rails, a Klose speed recorder and an arrangement for heating the train by steam from the boiler.

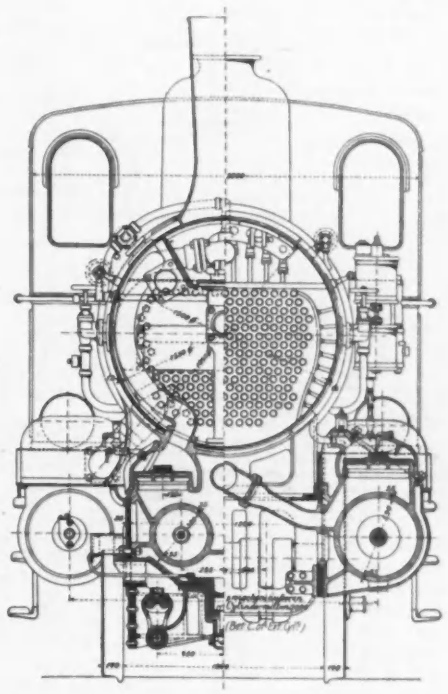
The principal dimensions are given in the following table:

Dimensions of Compound Express Locomotives; St. Gotthard Ry.

Running Gear.—	
Driving wheels, diameter	64 ins.
Truck " "	34 "
Journals, driving axles	9 x 9 ins.
Wheel Base.—	
Driving	11 ft. 6 ins.
Truck	6 " 0 "
Total engine	24 " 6 "
" tender	10 " 6 "
" engine and tender	45 " 5 "
Center truck pin to c. of leading driver	10 " 0 "
Wheels having blind tires	None
Weight in working order.—	
On driving wheels	99,000 lbs.
Engine, total (3-cylinder)	140,000 "
" " (4-cylinder)	143,000 "
Tender "	72,751 "
Cylinders.—	
(4-cyl. engine) diam. h. p., 14 ins.; l. p.	21 ins.
(3-cyl. engine) diam. h. p., 17½ ins.; l. p.	19 "
(Both engines) stroke	24 "
Dist. c. to c. of outside cyls.	6 ft. 9 ins.
Boiler.—	
Diameter of barrel inside	60 ins.
Thickness of barrel plates	11-16 in.
Thickness of smokebox tube plate	1 1-16 ins.
Height from rail to center line	7 ft. 6 ins.
Length of smokebox	6 " 0 "
Working steam pressure	205 lbs.
Firebox.—	
Length inside	7 ft. 6 ins.
Thickness of crown sheet	13-16 in.
Grate area	24.8 sq. ft.
Tubes.—Number	244
Diameter	2 ins.
Length between tube plates	13 ft. 0 "
Heating Surface.—	
Tubes, exterior	1,646 sq. ft.
Firebox	129 " "
Total with exterior tube area	1,775 " "
Miscellaneous.—	
Smokestack, smallest diameter	16 ins.
Smokestack, height from rail to top	14 ft. 5 "
Capacity of tank	3,963 gallons.
Capacity of coal space	5 tons



Cross-Section of Three-Cylinder Locomotive.



Cross-Section of Four Cylinder Locomotive.

COMPOUND EXPRESS LOCOMOTIVES; ST. GOTTHARD RAILWAY.

Philadelphia's great city hall, which has been the source of numerous municipal scandals during the many years which have elapsed since its foundations were laid, is again attracting attention in connection with the aluminum-plated ironwork and statue of William Penn which is to surmount its lofty tower. From reports published in the "Public Ledger" it appears that the Commission in charge of the building contracted with the Tacony Iron & Metal Co. to furnish the ironwork and plate it with aluminum, the city buying all the material and a large part of the general plant, erecting special buildings, tools, etc., and paying $5,000 a year for the services of the President of the company and $2,500 a year for the services of its General Manager and Superintendent. The company managed the business and furnished part of the machinery for a commission of 15% on the total expenditures in addition to the outlay by the city enumerated above. Up to this time the city has paid out about $618,000 on account of this work, of which about $113,000 is on account of the aluminum plating. There is also about $120,000 in unpaid bills still to be met. At the time this contract was given to the Tacony company, aluminum electro-plating was a practically untried process; in fact, it is claimed that no firm would have undertaken the work for a lump sum. If this was the case, however, it seems extremely doubtful whether the architect of the structure and those over him were justified in using the city's money in experiments, the success of which was by no means of great importance, so far as the city was concerned.

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The late test of American armor and of the ship frames against which it is placed, which was made at Indian Head on Sept. 4, is one of the most important and satisfactory that has yet taken place either in the United States or abroad. Heretofore, while the armor-plate has been subjected to all manner of tests, practically nothing was known of the strength of the frames behind the armor and their ability to resist the terrific impact of modern artillery. The experiments made some years ago in England upon an antiquated ironclad, and even the experience in the late Chinese-Japanese war, were of comparatively little value, for the reason that the frame construction of the latest type of war vessels is radically different from that tested in these cases. The general introduction of steel has tended towards lighter frames, and some authorities even went so far as to assert that under the impact of heavy projectiles, driven by modern and more powerful powder, the armor plates, if not broken or penetrated, would be driven into the vessel by the crushing of the frames. The experiment at Indian Head, elsewhere noted in this issue, conclusively proves the excellence and strength of American frame construction, at least under all the contingencies of ordinary warfare, and is another proof of the satisfactory design of our new warships and the engineering skill of American naval architects. The test has a far-reaching importance, for the result will be as carefully studied by foreign ship-builders as by our own naval authorities.

Another and scarcely less valuable lesson taught by the tests of Sept. 4 was the fact that for all practical purposes the new 14-in. armor now being placed upon our battleships forms as good a protection as the old and heavier 17-in. armor. This very desirable decrease in dead weight is made possible by the double-forging process, by which the plate is forged down both before and after it has been subjected to the carbonizing or Harveyizing treatment. This was the first official test of armor so treated, and the 14-in. plate practically withstood the test usually applied only to 17-in. plate. It is true that the armor was penetrated almost to its whole thickness and was cracked from top to bottom, but it kept out the shot, and the skin and frames were absolutely uninjured. In the most important sense of the word, it was a perfect protection for the ship and its crew.

An example of the work and expense incident to the maintenance and construction of street railway track (which expense is very often due to lack of consideration of correct economic and engineering principles in first construction) is afforded by the work now in progress for the relaying of track on the lower part of Fulton St., Brooklyn, N. Y., by the Brooklyn Heights R. R. This is a very busy section of the line, having a continuous procession of cars constantly passing over it, and when electric traction was introduced, about four or five years ago, the track was relaid with box rails, supported on chairs spiked to wooden ties, the ties resting on the subsoil of the street. About a year ago it was found necessary to renew the track where the heaviest traffic occured, and 6-in. girder rails supported on chairs were used, but these are now in turn being removed, and 10-in. side-bearing girder rails laid, these new rails resting directly on the cross-ties (except for the interposition of combination tie-plates and rail braces in some places), and having the joints spliced by heavy bars, with two rows of bolts, 12 bolts to each joint. The ties rest on the earth, and the track is surfaced in the usual way by tamping the ties, except that the tamping is with soft earth instead of well-drained ballast. Of course the load of the traffic will be distributed over a number of ties by the very stiff rails, though with lighter rails under such incessant traffic the earth foundation would probably not be found to give good permanent results. However, Mr. J. C. Brackenridge, Chief Engineer of the Track Department, states that the earth under the paving, when not excavated to a depth of more than 2 ins. below the permanent grade of the bottom of the ties and well tamped under the ties from end to end, makes the track sufficiently stable for the heaviest traffic. For ordinary track there is excavated only a hole large enough for each tie, but for complicated, special work, all the earth is removed to the level of the base of the ties.

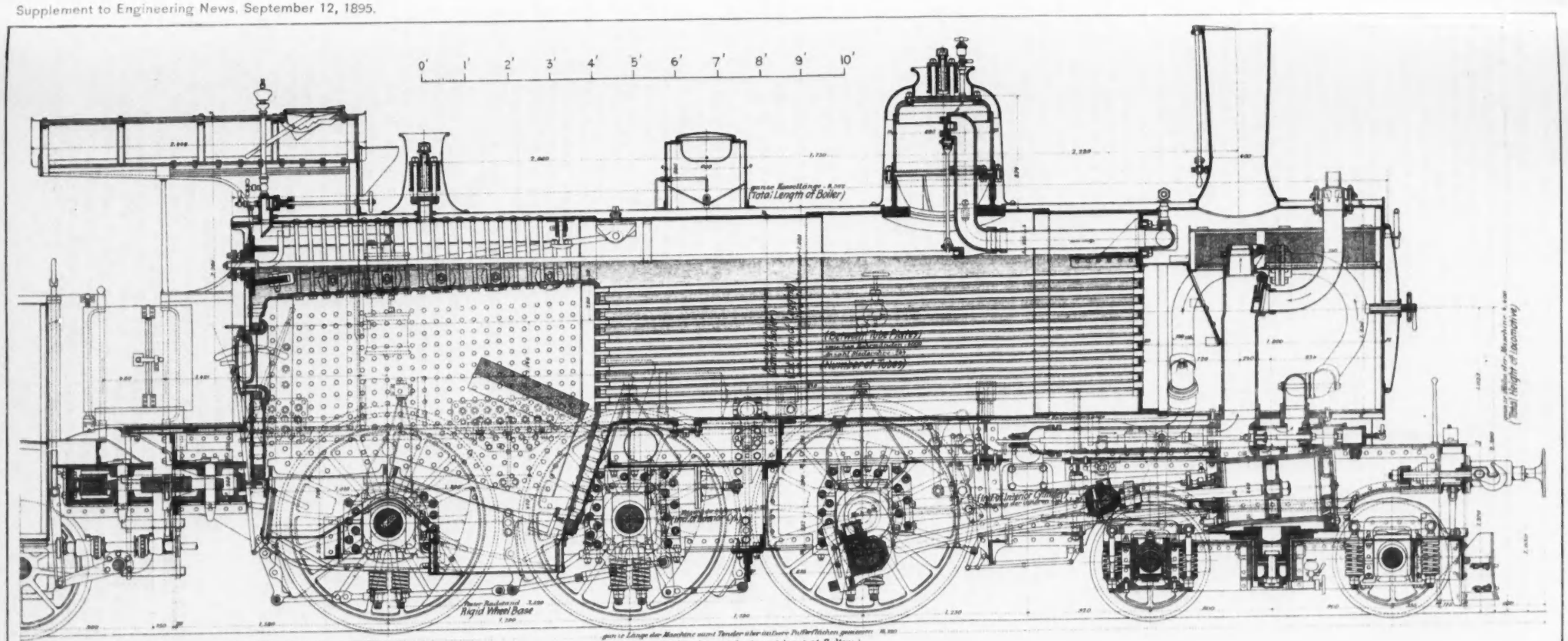
Coincident with this track work, the street is being repaved from curb to curb, and for this purpose a concrete foundation is being laid to receive the granite blocks, the concrete being laid between the ties and flush with their top surface, but not extending underneath the ties. The paving of Fulton St. has been in a notoriously wretched condition, but it seems probable that the new pavement will develop ridges and depressions along the tracks, owing to the alternating bearing of the blocks on wood and concrete, while it may also be noted that the surface of the new work is spoilt by leaving upon it a coating of gravel and dirt, which serves no useful purpose, as the joints have all been filled with clean gravel and grouted with tar, so that this top layer merely results in making muddy a pavement which might be exceptionally clean. While the track work involved in the reconstruction is necessarily very expensive, there is an additional expense incurred, due to the running of the cars on the roughest kind of temporary tracks at the side of the excavation of the old track. These temporary tracks are of strap rails, supported by occasional ties let into the surface of the paving, and by rough plank blocking at the numerous irregularities of the surface of the old pavement. Not only are the temporary tracks poorly built, but the connections to the undisturbed track are of a very rough character, with sharp curves and a sudden drop onto the old rails. The result of running the cars over this sort of track (and the cars are run at good speed during the busy hours), is the racking and wrenching of the truck frames, body and mechanism by the violent lurching and pitching motions and the sudden shocks to which they are subjected. There must inevitably be a consequent increase of cost for maintenance and repairs of equipment, though it is doubtful if this item is usually considered, as it should be, in computing the expense of rebuilding track.

The report of the U. S. Board of Engineers on the probable effect of the Chicago drainage canal upon the future level of the lakes is received very differently by the people of Chicago and by Detroit, Buffalo and the other lower lake cities, as would naturally be expected. The Detroit "Journal" figures that a lowering of 6 ins. in lake level means a reduction of about 180,000 tons in the annual carrying capacity of the lake fleet on an average basis of 30 tons to each inch of draft and multiplying this loss by the number of trips made each season by every freighter of maximum capacity. As the great bulk of the traffic is now carired in the larger vessels, this loss would be a serious one. Buffalo joins in the protest, and the Canadian authorities foresee trouble on the St. Lawrence. Chicago, on the other hand, sees much that is "vague and unsatisfactory" in the report, but generally regards the possible reduction of 6 ins. in lake level as a trifle, only appreciable to engineers, when the frequent changes in level due to prevailing winds and seasons of small rainfall are considered. Chicago admits, however, that there is some plausibility in the plea that the drainage needs of that city ought not to be permitted to interfere with the commercial demands of other cities on the system of lakes under existing conditions. The idea of ultimate government control of the canal is welcomed by some of the Chicago papers as a possible happy solution of what promises to be a troublesome problem, and as a step in the direction of making of the canal a great national waterway. They maintain that this was the original and all-important intention of the projectors of the enterprise, and they only fear that the present report may, in some parts of the country, arouse sufficient opposition to the canal scheme to postpone this desirable end. Others deny the right of the government to interfere in a state enterprise and see no profit in such a control.

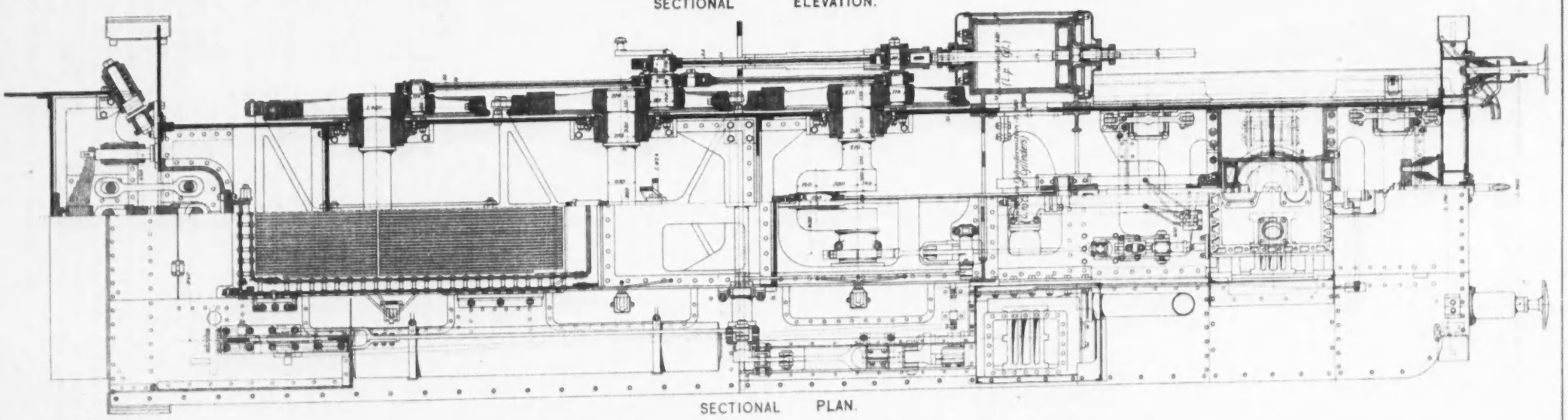
As to the federal authority over waterways in this country, the law is plain enough, and there is no need for discussion on that point. And when the many and various-sided opinions on other points are sifted out, it looks very much as if the only generally satisfactory solution will be the deepening of the lake channels and harbors ultimately to the 20-ft. limit at least. The owners of shipping on the lakes are steadily increasing the carrying capacity of their ships, and the future capacity is now only handicapped by the too shallow channels and ports. The tendency is, and has been for some time, to deepen the existing waterways, practically without reference to any reduction in general lake level by the outflow from the drainage canal. It is true that this outflow, if it amount to as much as 6 ins. over the lake surfaces, will increase by that amount the cost of improvement. But the amount of this increased expenditure will be a trifle compared with the sum Chicago is expending in making the canal.

One desirable result of this lively reawakening of interest in a really old problem will undoubtedly be a more careful and more complete study of the outflow of all the lakes and the average effect upon them as a system, of evaporation, varying rainfall, etc. Thanks to the government engineers, we know much about the lakes now, and the late board of engineers found sufficient data to enable them to fix within narrow limits the effect of the drainage canal flow. As the popular idea measured this effect by feet instead of inches, there is something substantial gained in dispelling this idea. But the engineers themselves admit that the material available is not undisputed, and is still insufficient for all purposes, and they recommend more careful and extended study. As this detailed and accurate information seems most essential in planning for the general improvement of the lake channels and harbors, we may after all have to thank the Chicago drainage canal for bringing about the collection of this important data.

The repeal of the Chicago building ordinance which forbids the erection of any building over 130 ft. high is being agitated by some of the real estate and building interests of that city, and it now seems quite possible that they will gain sufficient influence to accomplish their purpose in the near future. Ever since the passage of this ordinance (Eng. News, June 1, 1893) there has been great discontent among a few people with the clause restricting the height, but owing to the falling off in high building construction during the last two years, this discontent has not been strongly manifested. Now, however, as building in the business district is again becoming active, the an-


0' 1' 2' 3' 4' 5' 6' 7' 8' 9' 10'
ganze Kesellänge
(Total Length of Boiler)
Rigid Wheel Base
(Total Height of Locomotive)
(Total Length of Engine and Tender out to out of Buffers.)

SECTIONAL ELEVATION.



SECTIONAL PLAN.

Three-Cylinder Compound Express Locomotive for the St. Gothard Ry.

Built by the Swiss Locomotive & Machine Works, Winterthur, Switzerland.

CHAS. HART & SONS, LITH., 26 VESEY ST., N. Y.

tagonism to the ordinance begins to be voiced, and there is an energetic demand for its repeal.

Despite all this, the restriction was enacted for good and sufficient reasons and after careful consideration; and the business men of Chicago will do well to consider the question carefully before they lend their aid to its repeal. It is true that the excessive value of land about the business center in our large cities has made the tall building almost a commercial necessity, but there are other equally important questions to be considered, and, moreover, it may be questioned whether the erection of excessively high buildings does not tend to defeat the very end sought. The question of fire risk and of the public health and general welfare is more important than temporary profits of real estate holders. The fact is that the eventual result of this high-building construction, if it is allowed to go on unchecked, is not realized by people generally, because there are few cases where streets have been closely built up on both sides with such structures for any considerable distance. It needs but little observation, however, to show that on streets of ordinary width a height of 10 to 12 stories cannot be exceeded without transforming the street into a veritable canyon. Abundant sunlight and air have contributed much to make the modern tall office building more sought by tenants than the old-style five or six-story structure, but when 16 and 18-story buildings line both sides of a street, the lower five or six stories will be even worse off in these essentials than the old structures now being abandoned or given up to a poorer class of tenants. This will be especially true in Chicago and other Western cities, where soft coal makes the smoke nuisance an ever-present factor in the matter of light.

In one respect the modern skyscraper building has worked great benefit in real estate values—namely, that its competition has compelled the improvement and modernizing of neighboring buildings under the penalty of finding their value gone if they did not meet this competition. In Chicago this effect has been noticeably evident in the remodelling of buildings built ten or a dozen years ago, and it may be questioned if this expenditure of money in such improvements is not of a good deal more permanent benefit to the city than the tearing down of a few of these buildings and the erection of 16-story towers on their sites.

Of course, every owner of property who sets out to erect a building on land costing $50 to $150 a square foot naturally wants to build it as high as possible, so as to secure a larger floor space and increased rentals, but it ought to be plain enough that it is for his interest as well as for the public's that a limit should be set somewhere. It is not a benefit to him in the long run to erect a 20-story building if in a few years other property owners, by the erection of similar buildings all around him, make the lower stories of his structure unrentable.

HISTORY REPEATING ITSELF IN THE IRON TRADE.

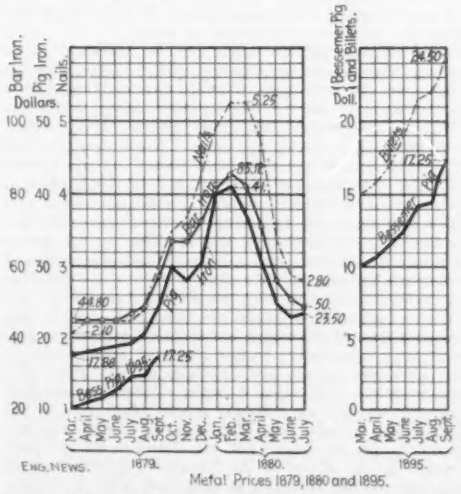
The iron trade is now experiencing a boom in prices similar to the famous one of 1879. During the nine months from July, 1894, to March, 1895, when the price of Bessemer pig iron at Pittsburg gradually sank from $12.50 down to $10 per ton, consumers could not be persuaded to buy otherwise than "from hand to mouth," and even after a slight revival set in in April, there was no evidence that any of them cared to anticipate their needs in the slightest degree. But at this time, when prices have advanced to over $17 per ton, or about $3 higher than the average in the prosperous year 1892, they are feverishly anxious to buy, and seem determined to force prices still higher. The condition of the trade as regards prices is almost exactly like that of the last two months of the year 1879. As the human nature of iron consumers is a constant quantity, there is every reason to believe that the boom of that year will be repeated, to be followed by a disastrous collapse like that which took place in the spring of 1880. The similarity of the present condition to that of 1879 is clearly shown in the following figures and the accompanying diagram. The figures for 1879-80 are taken from the monthly average prices published in old annual reports of the American Iron and Steel Association, and those of the present year from weekly market reports from Pittsburg.

Iron Prices in 1879-80. 1895.

	Anthracite No. 1 pig at Phila., per gross ton.	Bar Iron at Phila., per gross ton.	Cut nails at Phila., per 100 lbs.	Bessemer pig at Pittsburg, per gross ton	Billets at Pittsburg, per gross ton
1879.					
March	$17.88	$44.80	$2.10	$10.00	$15.00
April	18.00	44.80	2.25	10.75	15.75
May	18.50	44.80	2.25	11.50	17.00
June	18.75	44.00	2.25	12.50	19.00
July	19.25	47.04	2.25	14.25	21.50
Sept.	24.25	57.12	3.00	(Aug.15)14.50	22.00
Oct.	30.00	67.20	3.50	(Aug.31)16.25	23.50
Nov.	28.00	67.20	3.70	(Sept. 7)17.25	24.50
Dec.	30.50	72.24	4.25	.....	.....
1880.				.....	.....
Jan.	40.00	80.64	4.90	.....	.....
Feb.	41.00	85.12	5.25	.....	.....
March	37.50	82.32	5.25	.....	.....
April	31.00	71.68	4.75	.....	.....
May	25.00	56.00	3.40	.....	.....
June	23.00	51.00	2.90	.....	.....
July	23.50	50.00	2.80	.....	.....

In 1879 the prices of anthracite No. 1 pig iron and of refined bar iron were generally taken as the standard of comparison for iron products in general. Now, however, Bessemer pig and billets at Pittsburg are a better standard, since these two products are larger in quantity and value than any other two iron products that can be named, and Pittsburg is the most important center, both of production and of remanufacture. On the right hand of the diagram we have shown the 1895 prices of pig iron on a scale twice as large as that used for the 1879 prices, in order to give a better comparative view of the relative advance in the two periods. The bottom price of pig iron in 1879 was about $18, and that of 1895 about $10, the decrease being due to the opening of mines from which the ore could be obtained more cheaply than heretofore, to improvements in methods of handling and of transportation, and to improvements in machinery and methods of manufacture. The relative or percentage advance in the two periods, therefore, give a better basis of comparison than the actual advance in dollars and cents.

In the first six months of the boom of 1879, from June to December, the price of pig advanced from $18.75 to $30.50, a difference of $11.75, or 62.7 per cent. In 1895, in the six months from March to September, the price of pig advanced



Price of Pig and Bar Iron, Nails, etc., 1879, 1880 and 1895.

(Pig, bar iron and billets per ton of 2,240 lbs. Nails per 100 lbs.)

from $10 to $17.25, a difference of $7.25, or 72.5 per cent. In a single 30 days, in December, 1879, and January, 1880, the price advanced from $30.50 to $40, or 31.1 per cent. If a similar relative advance should take place during the present month the price of Bessemer pig would advance from $17.25 to $22.60 per ton, a higher price than it has touched since 1883, except during three months in 1887 ,when it reached $22.65 to $22.85, and the two months December, 1889, and January, 1890, when it was $23.75 and $23.60, respectively.

The chief lesson to be learned from the figures and diagram, however, is not how high prices may rise, but the fact that, after a rise above the normal level, a speedy fall is certain to come. In 1880 the fall came more suddenly than the rise. From $41 in February the price of anthracite pig fell to $23 in June, a drop of $18 in four months. The market became steady after the drop, at a slight advance, and for more than two years the price ranged between $24 and $26. Then it gradually fell, during 1883, 1884, and 1885, until in the latter year $18 was the average price for the whole year, a figure almost as low as that of the worst year of the depression which preceded the boom—viz., 1878, when the average price was $17.62. The year 1886 was one of the most active years the iron trade had ever experienced up to that time; but the average price of anthracite pig during the year was only $18.75. We have thus the notable result of improvement in mining, metallurgy and transportation, that the bottom price of pig iron during the great depression—viz., $17.62 per ton in 1878, practically became, within seven years, the normal price for a year of brisk trade.

If the history of prices should continue to repeat itself for the next six months as it has been doing for the past six, we should have the prices of Bessemer pig in Pittsburg running about as follows, using figures which show the same relative or percentage advance and decline as took place in 1879-80.

1895.		1896.	
September	$17.25	January	$17.20
October	22.20	February	14.00
November	22.80	March	12.80
December	20.80	April.	13.00

The above range of prices is what we might reasonably expect if all the conditions of the trade in 1879 were precisely repeated to-day. The human nature condition is undoubtedly the same. Consumers will refuse to buy beyond their actual necessities when prices are falling, but will increase their stocks, and thus do all they can to increase prices still farther when prices are on a "boom." But there was one reason for the boom in 1879 which does not exist to-day, that is, a temporary shortage of producing capacity. During the long depression from 1873 to 1879, furnaces had been allowed to fall into ruin, few new furnaces were built, and iron manufacturers seemed to have reached a settled belief that prosperous days for the iron trade had passed forever. Consequently no preparation had been made for the revival in demand, and when it did revive producers were taken unawares, and were unable to make pig iron fast enough to supply actual necessities of consumers. This situation is made evident by the statistics of total production of iron in 1879—viz., 2,741,853 gross tons, or less than 200,000 tons above the production of each of the years 1872 and 1873. But the "boom" soon caused the erection of new furnaces and the improvement in the methods of driving of old ones, and in 1880 the production was 3,835,191 tons, an increase of almost 40 per cent. The conditions of the furnaces now are altogether different from what they were in 1879. The Directory of the Iron and Steel Works, published by the American Iron and Steel Association, shows that the annual capacity of completed blast furnaces in January, 1894, was 16,271,027 gross tons, against 14,550,708 tons in January, 1892. The annual capacity of the completed rolling mills in January, 1894, was 12,477,890 tons, and in January, 1892, 10,563,655 tons. In November, 1889, the annual capacity of completed blast furnaces was only 11,757,348 gross tons, and in 1890 the actual production of pig iron was 9,202,703 tons, or over 78 per cent. of the capacity. Even if the furnaces now existing had no greater capacity than those existing in January, 1894, if they produced 78 per cent. of their capacity they would give a yearly product of about 12,700,000 tons, or 38 per cent. more than was produced in 1890. But farsighted iron producers have been taking advantage of the past two years of depression to put their furnaces in condition to meet any possible increase of demand, and there is no such reason for a sudden advance of prices as there was in 1879. If such an advance as is shown in the above figures takes place, it will be due entirely to the lack of foresight of consumers who will not wait for the inevitable fall, and not to any de-

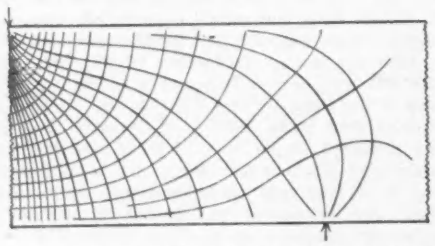
ficiency in the productive capacity of the blast furnaces.

As an example of the readiness of furnace owners to hasten the building of new furnaces as soon as prices increase, we may mention a report of a recent interview with Mr. Andrew Carnegie. The Carnegie Steel Co. is now building three or four new furnaces near Pittsburg, and he was asked the question: "Are there not already enough furnaces in the country to make all the iron it needs?" "What concerns me," said Mr. Carnegie, "is whether I shall be able to get the furnaces finished soon enough so that they can pay for themselves the first year." That a furnace could pay for itself in one year is not an unreasonable supposition. If a modern blast furnace of 100,000 tons annual capacity can be built for $300,000, it requires only a profit of $3 per ton, which may be made in a boom year, to make the furnace pay for itself in one year. Another report concerning Mr. Carnegie is worth quoting here. Whether true or not, it is what might be expected from a man of his remarkable business foresight. The report is that when consumers of Bessemer pig for many months refused to buy when it was at the bottom price of $10 per ton, delivered in Pittsburg, and when the other blast furnace owners bought coke only for immediate requirements, while it was also at bottom prices, Mr. Carnegie's company contracted ahead for as much iron as it could buy at $10 per ton, and, owning the largest coke works in the country, stored at its furnace plants all the coke for which storage could be found; a veritable mountain of coke was piled up. When these stocks had been accumulated, it was announced about April 1 of this year, without any previous warning, that the wages of the coke workers of the H. C. Frick Co. had been voluntarily raised 15 per cent. There was nothing in the apparent condition of the iron trade or of any other business at that time which could be given as cause for that advance. But the news was telegraphed all over the country, and an epidemic of wages raising was at once started. The price of coke of course was at once advanced to correspond with the increased cost of production, and this rise compelled an increase in the price of pig iron, but Mr. Carnegie had already loaded up with both coke and pig iron, and while others may envy him the financial gains he has reaped from his foresight and strategy, they cannot well complain, for his action has had much to do in bringing about the revival of industry and in increasing wages all over the country.

LETTERS TO THE EDITOR.

LINES OF STRESS IN BEAMS.

Sir: In answering the communication from "C. M. B.," in your issue of Aug. 1, relating to the lines of maximum shear in a beam subjected to flexure, Professor Merriman called attention to the use of polarized light for studying problems of this character by actual observation instead of by theory alone. In the "Philosophical Magazine" for December, 1891, Prof. C. A. Carus-Wilson has a paper describing some work of this kind. From it I take the subjoined Fig. 1, showing the lines of principal stress in a beam subjected to flexure by a single load, applied midway between the points of support. The beam was of glass, its dimensions being 128 mm. long, 19 mm. high, and 5½ mm. thick (5.04 × 0.75 × 0.22 ins.). The span was 60 mm. or 2.36 ins.



Lines of Principal Stress in the Right Half of a Beam as Determined by Polarized Light.

The curves shown in this case are those along which there is zero shear, and hence do not correspond to those of the figure in C. M. B.'s letter.

Rankine, however, has calculated the corresponding curves of zero-shear, according to the "common theory" of beams. By section 310 of his "Applied Mechanics," they would be as in Fig. 2, given herewith.

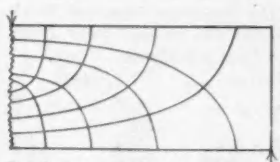


Fig. 2. Lines of Principal Stress in a Beam According to the "Common Theory." (Only the right half is shown.)

The principal reason for the difference between the theoretical curves of Fig. 2 and the actual curves of Fig. 1 is the small ratio of span to depth in the beam, shown in Fig. 1, and the consequent great relative effect of the local stresses due to the concentrated loads. It will be seen that the span in that case is only a little more than three times the depth of beam. The "common theory" applies with practical exactness only to cases in which the span is much greater, in proportion to the depth, than this.

Prof. C. A. Carus-Wilson also made some numerical determinations by means of polarized light of the intensity of the stresses in the glass beam of Fig. 1. Sir George Stokes has shown that the results agree very closely with those indicated by theory, when the local effects of the loading are taken into account.

With regard to the suggestion of Professor Merriman that work with polarized light could be profitably undertaken at technical schools, I would say that in 1893 I did work of this character at the College of Civil Engineering at Cornell University, at the suggestion of Professors Fuertes and Crandall. The results were published partly in the "Physical Review," of Cornell University, for September-October, 1893, and partly in the "Transactions of the American Society of Civil Engineers" for August, 1894. Other work of this nature is now in progress at the Iowa State College of Agriculture and Mechanic Arts.

The method applies especially to cases of plane stress. Two Nicol's prisms are needed. One, through which the observer looks, is called the analyzer, and is placed on one side of the strained glass; while the other, called the polarizer, is placed on the other side, and serves to polarize the light. When the polarizer and analyzer are set with their planes of polarization parallel, the observer sees on the strained glass a series of colored bands, each of which indicates a certain difference of intensity between the principal stresses, which difference is the same at all points through which the band passes. When the polarizer and analyzer are set with their planes of polarization at right angles (crossed) the observer sees, besides colored bands, dark bands on the glass, which pass through the points where the lines of stress are parallel or perpendicular to the plane of polarization of the polarizer (unstrained portions of the glass will also be dark). By taking a series of observations with the polarizer set at different angles, data can be obtained for mapping out the lines of stress, and for studying the intensities of the stresses at different points. In the article in the "Physical Review," above referred to, the method is described, and the intensities of stress corresponding to the different colors, when the glass is 1 in. thick, are given.

If Professor Merriman will compare the above description with the papers by Mr. Nickerson, in vols. III. and IV. of the "Transactions of the American Society of Civil Engineers," to which he referred in answering "C. M. B.," he will see that Mr. Nickerson did not understand how to interpret the results of his experiments with polarized light, and that what he says about the "breadth of the neutral zone," and "secondary neutral axes," not to speak of some other things, was mere vague speculation.

Very truly yours, A. Marston.

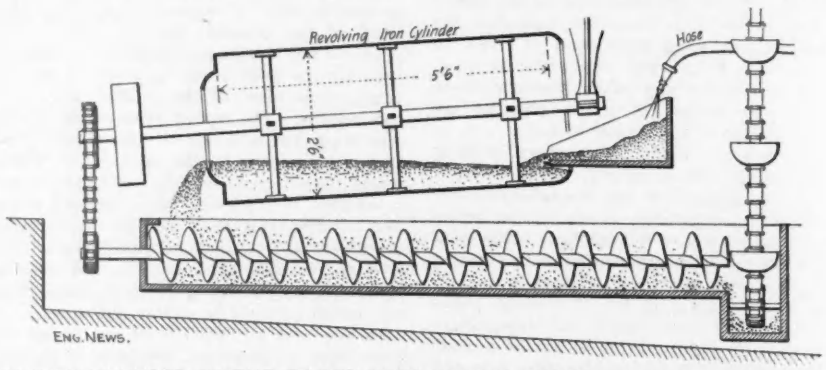
Ames, Ia., Aug. 8, 1895.

SAND WASHER FOR THE FILTER BEDS OF THE WATER-WORKS OF HUDSON, N. Y.

Sir: In answer to the inquiry of "E. M. N." in your issue of May 23, 1895, and to your own request for information regarding a machine for washing the dirty sand removed from filter beds, I send the following description of the plant in use at Hudson, N. Y. While I did not make a bacterial examination of the cleansed sand, in connection with my recent investigation of the filter plant, and cannot in consequence state the percentage of bacteria removed, a general inspection of the method employed and of its apparent results satisfied me that the washed sand was quite clean enough to admit of a high efficiency of purification by the beds.

There are two filters at Hudson, the larger one of which I shall take for illustration. Its area is a little less than a half-acre. To remove its carpet of sludge, together with about ¾ in. of sand, to a distance of six rods, takes 11 men 9 hours, working with broad-bladed shovels and wheelbarrows. The sand is dumped into a bin freely exposed to the air, where it lies until successive cleanings of the bed necessitate a larger supply of available material for its renewal.

The bin for dirty sand immediately adjoins a small frame building which contains the sand washer. When in operation the sand is shoveled from its bin through an open door in the building upon a stage which acts as a kind of hopper. From the stage it is introduced into a revolving iron cylinder 2½ ft. in diameter by 5½ ft. in length, shown in the accompanying illustration. A copious stream of water and a slight inclination from the horizontal assist in causing the agitated sand to traverse the length of the cylinder, where it falls into a wooden trough 1 ft. square in section, and running parallel to the cylinder immediately beneath it. The trough being closed at both ends, and there being an abundant supply of water, a constant overflow takes place along its entire length, while the sand itself, sinking to the bottom, is conveyed back to the open doorway by means of a revolving iron helix fitting closely to the sides of the trough. The overflow is relied upon to carry off the filth disengaged from the sand by attrition and immersed in the water. Finally the sand is raised by an endless chain of buckets through the doorway to an outside platform 30 ft. above and there collected in wheelbarrows and dumped in a pile convenient to the filter bed.



SAND WASHER USED AT THE FILTER BEDS OF THE HUDSON, N. Y., WATER-WORKS.

The engine is of 4 HP. capacity, the boiler is of 5 HP. capacity, and they easily turn the cylinder and helix, and operate the buckets and pump.

When running four men are employed at daily wages of $1.50, and the keeper and superintendent also lend their assistance. In this way about 32 cu. yds. of sand may be cleaned per day at a cost of about 20 cts. per cu. yd. Supposing the maximum recorded rate of filtration, and remembering that for two months of the year the beds do not act as filters because of the impossibility of cleaning due to the frost, the cost of cleaning the sand may be estimated at about 16 cts. per million gallons of filtered water. This is about 13% of the total cost of removing the dirty sand, washing it and replacing it upon the beds.

George A. Soper.

Gardner Road, Brookline, Mass., Aug. 20, 1895.

EXPRESS LOCOMOTIVES.*

The type of engine most suitable for high speeds depends almost entirely upon the nature of the road over which it has to perform its duty. If the road is of an easy and level character, and the loads of the trains to be hauled comparatively light, engines with single driving wheels are found to be most successful, owing to the fact that the adhesive power is not so important a factor, and the absence of coupling rods enables the engine to run with greater freedom. On the other hand, when the road is heavy and of a sinuous nature, engines with coupled wheels, having plenty of adhesion and tractive force, are found to

* Abstract of a paper presented before the International Railway Congress, London, by Mr. John A. F. Aspinall, Chief Mechanical Engineer of the Lancashire & Yorkshire Railway. The paper was accompanied by descriptions of specific express engines of various railways and countries, but we have abstracted only that part which discusses the subject generally.

give the best results. The most important part of a high-speed locomotive is its boiler capacity, for as the speed increases so will the demand for steam, the distance traveled in a given time being greater, and the train resistance augmented, consequently larger cylinders are required, and, therefore, steam must be more rapidly provided.

The engine which finds most favor in Great Britain and America is the four-wheel coupled type, the leading end being carried on a four-wheeled bogie (or truck). The bogie not only enables the engine to pass round curves easily, but also, owing to the longer wheel base, distributes sufficient weight at the greatest distance from the driving wheel. This tends to solidify the road, and it is then in the best position to support the heavier weight carried by the driving and trailing wheels. In this type the first thing to be considered is the rigid wheel base, which should be as short as possible, for if this is too long accidents may arise through broken coupling rods, caused by the severe strains to which they are subjected.

The maximum capacity of the locomotive boiler is nearly reached. In America, and on the continent of Europe, engines with much larger boilers can be constructed than in England, owing to the greater limits of the bridges and platforms in the respective countries. The rigid wheel base practically determines the size of the firebox, because longitudinally it has to be placed between the axles, and transversely between the main frames, the latter being placed at present as far apart as the wheels will permit. In America fireboxes have been made much larger by placing them above the frames and pitching the boilers very high, a practice which in this country cannot be accomplished on account of our bridges. This method has the additional advantage of enabling the wheel base to be shortened.

The question as to what may in future be done in the way of an increase of speed on railways is one which has received a great deal of attention from many railway authorities, and though, perhaps, the fastest running that we have heard of as yet has been made upon the New York Central R. R. in America, it is a question whether such high rates of speed can be maintained upon the more crowded railways of England, upon which the average speeds are already very much faster than are found on the continental railways. In 1892 Mr. Theo. N. Ely, Chief of Motive Power of the Pennsylvania R. R., pointed out, with regard to the possibility of attaining an average speed of 100 miles an hour, that first of all we must know how soon after receiving warning of danger a train running a mile in 36 seconds can be stopped. He estimated that if running at 60 miles per hour, with the full braking weight of the train utilized, and the rails in the most favorable condition, this train could be brought to a full stop in 900 ft.; at 80 miles per hour, in 1,600 ft.; at 90 miles per hour, in 2,025 ft., and at 100 miles per hour, in 2,500 ft. These figures at once establish the fact that under the best possible conditions the track must be kept clear of all obstruction for at least 2,500 ft. in advance of a train running at the highest limit; but we must estimate the clearance for the worst conditions, such as slippery rails, foggy weather, and unfavorable grades. The personal equation of the engineman must also be considered in a train covering 145 ft. each second. Would it, therefore, be too much to ask that the engineman receive his warning at least three-quarters of a mile before he must halt? Mr. H. Walter Webb, of the New York Central R. R., at about the same time stated that having acquired a clear track for a certain train, they actually ran from New York to East Buffalo, a distance of 436.3 miles, in 439.5 minutes, and, dealing only with the higher speeds attained, he stated that 151 miles were run at a rate varying from 65 to 70 miles per hour; and 37 miles were run at a rate varying from 70 to 78 miles per hour. It was for this road that the celebrated No. 999 engine, designed by Mr. William Buchanan, was built, and speeds much in excess of the maximum named have been actually attained in practice with this engine. In the "Engineer," London, for March 7, 1890, was recorded a speed of 90 miles per hour, which was attained on the level with a two-cylinder compound engine, built by the Northeastern Ry., hauling a train of 18 cars, the gross weight of which was 310 tons.

Another American writer, however, Mr. David L. Barnes, in speaking of very fast running, says that "high maximum speed is spectacular, but not practical, while a high average speed is a real necessity, and can be obtained." He states in a similar manner to the writers previously mentioned, the absolute necessity for larger boiler capacity than we at present possess, and further, that "high average speed on heavy grades is impossible within the limits of steam locomotive construction," from the fact that a grade of 1% demands about 1,500 additional horse-power at 100 miles per hour, and 900 at 60 miles an hour. This shows how a light grade may increase considerably the demand on the locomotive boiler at high speed.

Mr. Du Bousquet, President of the French Society of Civil Engineers, pointed out in March, 1894, that speeds of 75 miles per hour are attained daily on down grades by express trains in their ordinary running, thus showing that high speeds are not dangerous. The reason why such speeds are not maintained on the level is, he states, because the engines are not sufficiently powerful. "The drawbar pull which would give a speed of 75 miles per hour on a down grade of 1 in 200, would only give a speed of 57½ miles per hour on the level, and 31¼ miles per hour on an up grade of 1 in 200. To increase the average speed by a small amount, the power of the engine must be greater in proportion; thus, if 322 HP. is sufficient to haul a train at 50 miles per hour up an incline of 1 in 200, 2,960 HP. will be required to draw the same train up the grade at a speed of 125 miles per hour. In dealing with such high speeds, the weight of the engine per horse-power generated is of importance, as there is always a limit of speed beyond which the engine cannot draw itself, let alone a train as well. At present French express locomotives weigh about 158 lbs. per I. HP., when exerting their minimum effort. By an application of the these figures, we find that to draw a train of 100 tons at a speed of 75 miles per hour up an incline of 1 in 200, an engine would have to weigh 130 tons and generate 1,810 HP. If the speed was increased to 87 miles per hour on a similar incline, the engine would have to weigh 468 tons and generate 6,532 HP.

The compound systems now generally adopted for locomotives are the Mallet and Worsdell-Von Borries (two-cylinder), the Webb (three-cylinder), and the Vauclain (four-cylinder), the latter being mostly used in the United States. In compound locomotives the cylinder proportion should be so arranged that the combined effort is as continuous as possible, as otherwise the engine would be unbalanced, and heavy shop repairs would result. This is most important in the two-cylinder system, and the accumulated experience points to the volume of the low pressure being at least double that of the high-pressure cylinder. A difficulty arises in the two-cylinder system, from the fact that the least objectionable position for them is between the frames, and even this necessitates cutting the frame on the low-pressure side. Another important matter is the steam port area of the low-pressure cylinder. In an ordinary locomotive this is about .10 of the piston area, and, if this proportion is carried out for a large cylinder, the result would be an unwieldy and heavy slide valve, consequently these figures cannot be applied, and the ports are smaller, but the difficulty of steam admission is overcome by the use of the Allen or double-ported valve, which gives approximately twice the amount of steam for a similar travel of an ordinary valve.

The greatest tractive force of a locomotive is generally required at starting, consequently a special valve is provided to enable boiler steam to be admitted into the low-pressure steam chest. This steam is reduced in pressure by wire-drawing it through a small pipe, and relief valves are placed in connection with the cylinder and the steam chest to insure no excessive pressure. Many engineers consider that the action of this valve should be made quite independent of the driver, lest he should be tempted to use it too often and endanger the economy of the engine. On the other hand, rapidity at starting is gained if the driver can control the valve by hand. Another, and most important auxiliary, is what may be termed the intercepting valve, which should be so arranged that the exhaust from each cylinder is independent, a point worthy of emphasis, as then, in case of failure to either cylinder, the engine can work itself home. To insure a constant supply of steam at a uniform pressure to the large cylinder, the receiver capacity of the two-cylinder compound, with its crank at right angles, should be at least equal to the volume of the high-pressure cylinder. The receiver should be well protected, and when placed in the smokebox it derives great benefit from the hot gases superheating or reviving the steam.

The information which has hitherto been published in England with regard to compound engines is not of an extensive character, but one of the most complete sets of figures is that which Mr. Wilson Worsdell, Locomotive Superintendent of the Northeastern Ry., has prepared in regard to the working of compounds made to the design of his brother, Mr. T. W. Worsdell, when he was the Locomotive Superintendent of that road. The figures show that there has been an economy in the maintenance of these engines as compared with ordinary engines, but, on the other hand, the consumption of oil has increased. The author thinks that neither of these items is consequent upon, or in any way connected with, the compound principle. The summary is as follows, showing an economy of 8.4% in coal consumption in favor of the compound engines:

	No. of engines.	Mileage.	Coal cons. per mile.
Simple	447	14,807,261	35.52 lbs.
Compound	395	13,799,482	33.45 "

A statement published by Mr. Webb, of the London & Northwestern Ry., of one week's running of the three-cylinder compound "Greater Britain," in 1893, showed a coal consumption for 3,588 miles of 29.87 lbs. per mile, exclusive of coal for firing up, or 31.07 lbs. per mile inclusive of such coal (Eng. News., Sept. 28, 1893).

Of four Vauclain four-cylinder express engines on the Baltimore & Ohio, Philadelphia & Reading and Central of New Jersey railways, the heaviest is 129,000 lbs., and the lightest 120,760 lbs., being very much in excess of any of the weights of engines, other than tank, on any English railways. The Eastern Ry. of France has engines which approximate to these figures, the extra weight of these engines being caused by being fitted with the Flaman type of boiler, in which the ordinary barrel is completely filled with tubes, while the necessary steam space is obtained by fixing a second barrel on the top, large passages being provided between the two. With this arrangement it appears that the total heating surface has been increased 54½% and the grate area 17%. The steam pressure in the boilers of the four American engines is in each case 180 lbs. per sq. in. The highest boiler pressure recorded is that shown by the Paris, Lyons & Mediterranean Ry., 212.9 lbs., the Northern and Southern railways of France having 198.6 lbs. per sq. in.

To obtain the best possible results from a compound engine, it has been found by experience that the high-pressure cylinder should be made at least 1 in. larger in diameter than one of the cylinders of a simple engine having the same power. At the same time the boiler pressure must be increased by 20 lbs. or 30 lbs. per sq. in., and Mr. Worsdell, in his latest compound engine, has gone still further, and introduced 40 lbs. per sq. in. more than the simple engine working in the same link. The total pressure of the compound is 200 lbs. per sq. in., which is the maximum in this country, exceeding the American, and following very closely upon the French practice. This increase of presure has also become necessary, owing to the extra length and sinuous nature of the steam passages, and to overcome the resistance in the receiver. It must be remembered that the final pressure of the blast of a simple engine is of great importance, and also, that in the compound the number of beats is reduced 50%; consequently, if the exhaust pressure is too low the efficiency of the boiler is reduced. By the adoption of high pressure the boiler and all steam joints must be made proportionately stronger, also lubricants having high flash points become necessary, and the gland packing must be constructed to withstand the extra temperature. The latter point is not now of such serious importance, as the excellent systems of metallic gland packing which modern practice has introduced enable engines to run for even twelve months without repacking.

From the foregoing statements it appears that a large and varying amount of fuel economy has been attained by the compound system, and the question now arises, will it cover a reasonable interest on the extra first cost and repairs? In the matter of first cost, it is probable that the high pressure will cause a corresponding increase of expenditure for boiler power. Excluding the latter, and when compounding is carried out by the aid of two cylinders, the expenditure should not be excessive, but when obtained by the application of three or more, it may be expected to be greater. The simple engine is the product of years of accumulated experience, and therefore has this great advantage over the compound, but it is well known that the heavy repairs are carried out in the firebox and boiler, the mechanism of the engine requiring the least attention. In compounding, higher pressures are required, therefore more frequent boiler repairs will be the outcome; but with regard to the other parts of the engine they should not be excessive, and even those failures which have occurred may be attributed to untried designs. The general impression is that compounds are more economical in slow than fast running, which may be attributed to insufficient areas of the exhaust passages and the sluggish action of low-pressure steam. On the face of this it would appear strange that in this country there are more passenger than freight compounds, which is due to greater attention being devoted to the passenger engine owing to the increased demands of the public. The principle has made less progress in this country than it has abroad, perhaps because it has a most formidable predecessor in the English simple engine, which is so economical and satisfactory in most respects. Undoubtedly the strongest argument in its favor points to its almost exclusive use in those countries where fuel is much more expensive than in England. On the Continent, and in America, it appears to be gaining favor, if numbers are an indication.

Balanced slide valves have not been used to any great extent in England, but numerous experiments have been tried at various times, which have tended to

show that the difficulties of repair were such as to retard their introduction. A paper by Mr. J. C. Park in the Proceedings of the Institution of Civil Engineers, vol. XCVIII., page 369, gives diagrams of many designs that were tried on the North London Railway. On the other hand, the author wrote a paper, also printed in the Transactions of the above Institution, vol. XCV., page 167, giving the results of some experiments with a valve dynamometer, which, in his opinion, at that time tended to show that as the coefficient of friction was only .068 the gain to be anticipated by using a balance valve was so slight that it would not be worth while departing from the simple form of D valve. The experiments recorded in the author's paper were all made with valves resting against a vertical face. Since the time when that paper was written he has had reason to believe that the same view cannot be held with regard to valves resting on a horizontal face, where the wear and tear seems to be greater, possibly on account of the fact that the lubricant is more readily swept away by any water that may get into the cylinders. The use of valves in the horizontal position is almost universal in the United States, where cast iron valves are the rule, and they are very frequently of the Richardson semi-balanced type.

Mr. W. Worsdell, of the Northeastern Railway, has supplied particulars of a piston valve used on that railway, which is responsible for saving 50% wear and tear in the slide valves and motion, as compared with ordinary slide valves working at the same pressure and performing the same duty. It is used in express engines at 175 lbs. per sq. in. Mr. Johnson, of the Midland Railway, has tried piston valves for some years, and recently he has fitted five express engines which are reported to have used 6.8 lbs. of fuel per mile less than engines with ordinary valves in the same service. On the Lancashire & Yorkshire Railway the author has tried a form of partially-balanced valve placed above the cylinders, which so far has shown great advantage in wear, and those engines with which it has been fitted show an economy in fuel. It would at first sight be expected that the somewhat longer steam passages would involve a loss; but this does not appear to be the case, and it may be accounted for by the fact that the steam chest stands well up in the smokebox, and therefore obtains some advantage from the heat of the smokebox gases.

When engine building is regarded from the point of view of diminishing the strains on the permanent way, the internal disturbing forces of the locomotive, which tend to unsteadiness in running, must be considered. These forces originate from the revolving and reciprocating parts of the motion; they are intensified at high speeds, and many attempts have been made to perfectly overcome these defects. However, it still remains that balance weights have to be placed on the rim of the driving wheels, which only truly balance the revolving parts, and it is purely imaginary to suppose that these weights will perfectly balance the reciprocating parts. This could only be accomplished perfectly by introducing equal and opposite reciprocating weights, but this is never done on account of extra cost, friction and complication. By attempting to overcome this difficulty with weights in the wheels, an auxiliary vertical force is introduced which tends to increase the pounding action upon the rails when descending, and decrease the adhesion during ascending. Some very interesting experiments upon the pressure between the wheel and rail due to counterbalance have recently been made by Prof. Goss at Purdue University, which were given in a paper read at the New York meeting, December, 1894, of the American Society of Mechanical Engineers, and it is shown that the wheels left the rails at certain speeds. This emphasizes the well-known fact that all reciprocating parts should be as light as possible, consistent with strength and durability, because they not only add to the gross weight of the engine, but also for portions of the stroke are retarding agents. The result of these disturbing forces may be classed under two headings, namely, a fore-and-aft motion, caused by the revolving parts meeting a horizontal component, and a rolling, sinuous motion, set up by the vertical force acting first upon one side and then on the other, of the engine; of the two the latter is of lesser importance. The obliquity of the connecting-rod has also a disturbing effect, and to moderate this the driving wheels should be placed as far back from the cylinders as convenient, so as to obtain a long connecting-rod. For one reason, the wheels should be placed well apart, as the weight of the engine is then distributed over a greater surface of the road, and consequently strains per sectional area are diminished; but at the same time an extra length of rigid wheel base acts severely on the permanent way when passing round curves. A high center of gravity promotes ease in running; it is consequently less destructive to the road, as the weight of the engine is almost entirely thrown more direct onto the vertical center of the outer rail, preventing the wheels from mounting when passing round curves at high speeds. It must not, however, be overlooked that the higher center of gravity when passing round a curve causes the load on the inner rail to be diminished, and, as the front end of the engine is liable at any time to be thrown violently to the inside, it will have a tendency to leave the road if the superelevation of the outer rail is excessive. All things considered point to the advantage of high centers of gravity and the use of wheels of large diameter for the continuous high speeds which are now possible by improved tracks and signaling. The piston speed becomes less, and therefore the retarding effects of the reciprocating parts are reduced. Compound engines have a disturbing effect on the track.

The discussion on this paper turned principally on the use of the truck and the compound system. Mr. Baudry, of the Paris, Lyons & Mediterranean Ry., preferred the four-cylinder compound system with each pair of cylinders driving a separate axle, as in the engine shown in our issue of June 13, 1895, and he also stated that on several engines trucks are being substituted for single leading axles. Mr. Webb, of the London & Northwestern Ry., prefers his three-cylinder compound system, driving two axles and eliminating the usual coupling rods, and also prefers the use of a single radial leading axle instead of a truck. It may be noted, however, that on the modern long cars of this road radial axles have been superseded by trucks. Mr. Webb has got a mileage of 26,000,000 miles with 90 engines, and has even got 3,600 miles per week out of one engine by putting two or three crews to the engine, the object of this being to ascertain as quickly as possible any weak points of the construction. The express trains made up of corridor cars weigh from 354 to 360 gross tons. Mr. Worsdell, of the Northeastern Ry., considered the use of trucks necessary for the easy passage of an engine over curves at high speeds. Express engines with two coupled pairs of driving wheels are used north of Newcastle, where the grades are severe, and engines with a single pair of driving wheels are used south of that point, where the grades are much easier. Most of the engineers advocating the use of trucks, favored the swing-center pattern, but Mr. Theo. N. Ely, of the Pennsylvania R.R., stated that in consequence of a patentee's claim for royalty, an experiment was made by wedging the swing links, and the rigid-center trucks thus obtained were found to be as satisfactory as before. In consequence about 2,000 trucks had been changed from the swing-center to the rigid-center type.

THE VERONA TRACK JACK AND TRACK GAGE.

One of the latest patterns of track jacks put upon the market is the ratchet jack shown in Fig. 1, which has been designed to combine lightness with strength and easy working. The frame is of malleable iron, with a base 7×12 ins., as recommended by the Roadmasters' Association of America. All the other parts are of crucible steel, with the exception of the loose pipe handle, which can be fitted to the lever. The rack bar, A, has a sectional area of 1½ sq. ins., and is operated by the lever B and pawl D, while the top catch, C, holds the bar in position at the height at which it is set. The load can be let down one tooth at a time when required, and can be dropped instantly and with certainty by the lower pawl, no independent trip being required. The jack is 21 ins. high, and has a lift of 14 ins. All the working parts are strong and simple in construction, and the jack weighs only 51 lbs., while its lifting capacity is 10 tons.

On roads having a track circuit for a block signal system, metal track gages cannot be used, as they short-circuit the current and affect the signals in the same way as the wheels and axles of a train. This has led to a more extended use of track gages with wooden bars, but of better

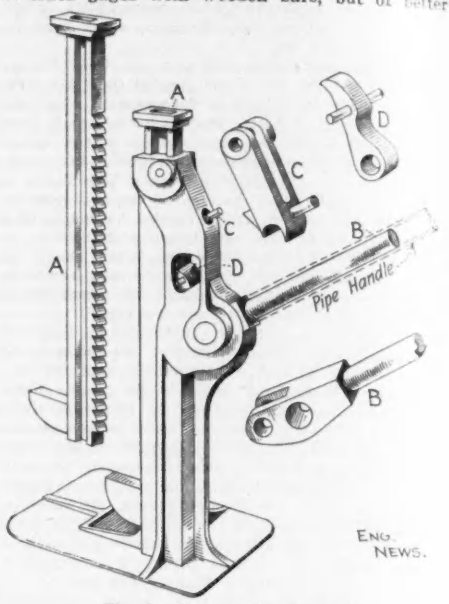


Fig. 1. Verona Track Jack.

construction than many of the old wooden gages used on minor roads. In Fig. 2 is shown a gage of this kind having steel ends securely riveted to a white oak bar 1¼ ins. square. To ensure greater rapidity and accuracy in testing the gage of track than can be ensured with a single lug on each end, one end of the gage has a steel fork with two lugs, so that by holding the fork with both lugs bearing against the line rail, the bar will be truly at right angles to this rail, and the other lug will give the accurate gage between rails. The same cut also shows an all-metal gage having a bar of 1-in. gas pipe shrunk upon steel ends and riveted to them. The gage with the wooden bar weighs 8½ lbs., and that with the iron bar weighs 12 lbs.

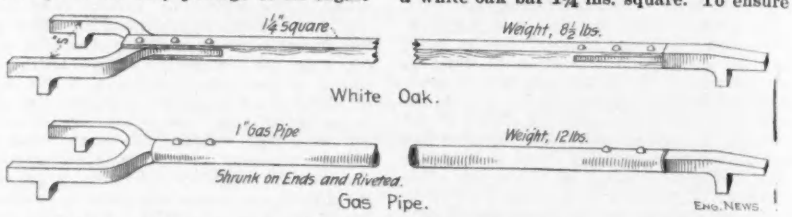


FIG. 2. VERONA TRACK GAGES WITH WOODEN AND IRON BARS.

The jack and gages above described are manufactured by the Verona Tool Works, of Pittsburg, Pa.

NOTES ON HIGH MASONRY DAMS.*

By John D. Van Buren, M. Am. Soc. C. E.

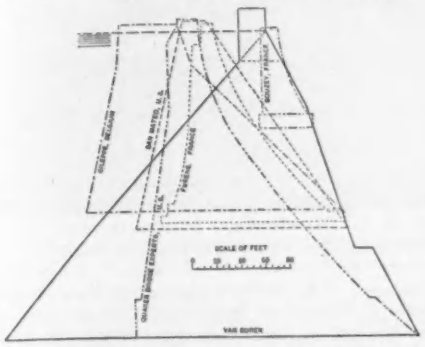
Five different conditions of safety are to be considered in relation to masonry dams: 1, against overturning; 2, against sliding; 3, against crushing near the toe; 4, against ice and waves; 5, against undermining. After the engineer has fixed upon these conditions of stability or safety, which express his scientific and practical judgment, the design of the section is easily made by the aid of simple mathematical formulas. In addition to the usual forces assumed to act on a dam, the author considers a water pressure on the base under full head. This force is usually ignored in designing the section, under the supposition that the masonry can be either made practically water-tight or drained in such a way as to relieve this pressure.

Not only does water under a high head percolate with comparative freedom through the best masonry, but shrinkage or settlement cracks or natural fissures give it free paths, to a greater or less extent, into the body of the masonry or foundation. No skill in the construction of large masses of masonry can prevent the existence of such cracks, nor can all dangerous fissures

*Abstract (from the Society's bulletin) of a paper to be read before the American Society of Civil Engineers, Sept. 18.

in the foundation be discovered and closed. It is impossible, without increasing the section enormously, to provide against all dangerous cracks, but by making it heavy enough to withstand a base water pressure, the safety of the structure against such dangers is increased immensely. In order to provide against or relieve such a pressure without increasing the section, the plan has sometimes been adopted of draining the masonry and foundation. But should the drains be too small for the leakage, the pressure may remain practically unreduced, except by the head lost in the flow. Again, should the leakage be large, the flow through the drains under a high head may be powerful enough to wear them away or dislodge the masonry, and thus destroy them and ruin the dam. The violent vibrations caused by the flow of large streams through such conduits under high heads are certainly an element of danger, and the conduits require the very best masonry. It would seem to be the safer course to omit all such drains, to keep the leakage divided into small streams by making the masonry and foundation as tight as possible, and to make the section large enough to be entirely stable under a full water pressure on the base. The introduction of this force will entirely change the section usually adopted.

Nothing practical is gained by considering any other section than the triangle. This is the true shape at all levels for stability against overturning and sliding. The additional masonry required to give proper crest



width is too small in amount to affect the problem materially, and the maximum toe pressure can be provided for by altar courses at the base. A triangular section can be designed so that it will satisfy at once and precisely both the assumed conditions of stability against sliding and against overturning, and this is modified easily for crest width, ice pressure and toe pressure, without sacrificing economy. It is evident that the most economical section against sliding is a triangle with a toe angle of 90°, and that the best section against overturning is a triangle with 90° at the heel. Between these two extremes there is a triangle which will satisfy precisely both conditions of stability, which is the required section, subject to modifications for ice and toe pressure.

Five assumptions are made by the author as the basis of his mathematical discussion: 1, that there shall be a full water pressure on the base at all levels; 2, that the ground pressure shall be a uniformly varying force; 3, that the coefficient of friction shall be known; 4, that the pressure at the toe shall not exceed a certain amount per square foot; 5, that there will be a known ice pressure per linear foot of dam at the crest. The final section advocated by the author is shown in the figure herewith, which also shows to the same scale the cross-sections of several large masonry dams.

SPECIFICATIONS FOR ENGINEERING TEXT-BOOKS.*

By Ira O. Baker, M. Am. Soc. C. E.**

The author mentions the difficulty of giving young men a general and also a professional education in only four years, and says that the difficulties can be decreased by improving the quality of the text-books. He claims that his specifications apply in most particulars also to engineers' reports, contributions to the proceedings of engineering societies and to engineering periodicals.

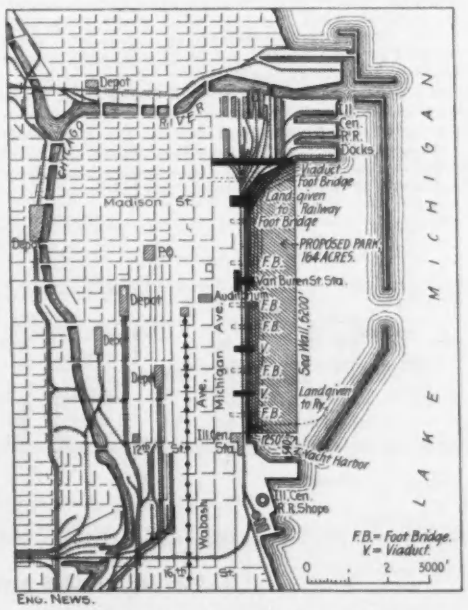
His specifications are: 1. The matter should be arranged in proper sequence. 2. The language should be clear, concise, and forcible. 3. The running titles and the headings should be so arranged that the reader can easily and quickly find any particular part. 4. Diagrams and figures, as far as possible, should be inserted at the most convenient place in the text, and be accompanied by a descriptive legend. 5. Folding plates should be placed at the end of the volume. 6. Folding plates should have a blank stub, such that when the plate is unfolded the printed matter will be entirely outside of the body of the volume. 7. The several divisions should be indicated by proper headings, and the minor sub-divisions (sections) should be numbered continuously through the volume, chiefly for convenience of cross reference. 8. Cross references should state also the page. 9. Attention should be given to the typographical arrangement of mathematical formulas. 10. The nomenclature should be suggestive of the quantity represented. 11. The nomenclature should be prominently stated before being used. 12. Each table should have a serial number, and a fully explanatory title at its head. 13. Tables should be divided horizontally by frequent lines. 14. Each horizontal line of a table should have a serial number. 15. The vertical major divisions of tables should be indicated by double rules. 16. The relative positions of the several columns of the table should have consideration. 17. Matter of minor importance should be printed in finer type. 18. The book should have a very full index, with page references. 19. The collection of "useful tables" frequently printed at the close of the volume should be preceded by a list of titles. 20. The mechanical execution should be in keeping.

*Abstract of a paper read at the annual meeting of the Society for the Promotion of Engineering Education, at Springfield, Mass., Sept. 2, 1895.

**Professor of Civil Engineering, University of Illinois, Champaign, Ill.

PROPOSED LAKE FRONT IMPROVEMENTS IN CHICAGO.

The long-talked-of construction of a lake front park and the depression of the Illinois Central R. R. tracks north of 12th St., in Chicago, now seem likely to materialize into a definite agreement for the work. As the result of a series of conferences held between the city officials and the officials of the railway company, an informal agreement has been arrived at, and as soon as it is signed and ratified by the City Council it is stated that work will begin. At present the only doubtful feature is the action of the City Council, as far as the city's and railway company's part of the work is concerned; but as the plan involves the filling of a portion of the harbor, the Federal Govern-



Map of Business Portion of Chicago, Showing Proposed Improvement of Lake Front.

ment may require some modifications or prevent that portion of the work altogether.

The improvement agreed upon calls for an expenditure of about $1,100,000 by the Illinois Central R. R., and the work is clearly shown by the accompanying sketch map. The present Lake front park extends from 12th St. north to Randolph St., lying directly east of the business section of Chicago, and between it and the lake shore lie the railway tracks, terminating in a car yard at Randolph St., and shutting off communication with the lake shore.

By the terms of the agreement the railway company agrees:

(1) To depress its tracks 4 ft. below present grade between Randolph St. and Lake Park Place, and build retaining walls on either side at cost of $450,000.

(2) To construct a sea wall 7,450 ft. in length along the eastern and southern water fronts of the proposed lake front park at a cost of $200,000.

(3) To fill in the present lake front park from Michigan Ave. to a level with the top of the retaining wall along the depressed railway tracks at a cost of $75,000.

(4) To extend the present Randolph St. viaduct on a curve into the new or outer lake front park at a cost of $75,000.

(5) To construct four carriageway steel viaducts across the depressed railway tracks at Madison and Van Buren Sts. and at Hubbard and Eldridge Courts at a cost of $80,000.

(6) To construct steel footbridges and bicycle ways across the depressed tracks at other street crossings at a cost of $20,000.

(7) To cede to the city joint navigable rights in a strip of submerged land 200 ft. wide and 1,250 ft. long at the southern end of the proposed park, and construct a breakwater or pier at the eastern end thereof for the shelter of pleasure craft, at a cost of $50,000.

(8) To fill in eight acres of submerged land at Randolph St. and at Lake Park place for additional track room at a cost of $80,000.

(9) To construct a commodious underground suburban passenger station at Van Buren St. at a cost of $25,000.

The city will be obliged to fill the submerged land between the sea wall and the present lake shore itself and it hopes to be able to do this at very little expense by getting the contractors of Sections O and N of the Drainage Channel to dump here the material which they are now carrying out into the lake. With the proposed area of 164 acres filled in, and the present park lands added, a lake front park of 205 acres will be secured, through which the railway tracks will run about 16 ft. below grade at the retaining walls, from which the land will gradually decline at either side to the level of Michigan Ave., or about 11 ft. above the tracks.

No definite details of construction have been decided upon, except it is stated that the sea wall will be built of piles, with stone filling and capped with a cut stone coping 20 ft. wide and 6 ft. above water level. The viaducts are to be of steel and of an ornamental construction suitable to the location, and all other work is to be carefully and thoroughly done.

ELECTROLYTIC CORROSION OF WATER PIPES IN BOSTON.

The recently printed annual report of the City Engineer of Boston, Mr. Wm. Jackson, contains the report of Messrs. Stone & Webster, consulting experts, on the effect of electric ground currents upon the pipes of the Boston water supply system. The work of investigating this matter was begun by this firm two years ago, and during 1894 the investigation was especially devoted to determining, as definitely as possible, the extent of the injury thus far done, and to acquiring information on which to base a prediction as to how long a time would probably elapse before damage of a serious nature would result to the piping system as a whole from electrolytic corrosion, if allowed to continue at its present rate. The results arrived at by the investigation are summarized as follows:

1. In certain places throughout the city electrolytic action is taking place; pipes have already been more or less injured, and are subject to premature decay.

2. The many excavations which have been made about the city for the purpose of inspecting the pipes have given only negative results, revealing no marked action, and yet not proving that the natural decay had not been accelerated by electrolysis.

3. Action of a serious nature is confined to special localities, where, owing to certain conditions of the railway system, abnormal currents are flowing through the earth, but, as a whole, the action has been reduced to so small an amount that it is now difficult to detect.

4. In the places where action is found, special precautions in provision of return feeders, and connections with the piping system by the Street Railway Co., will ordinarily reduce the difficulty to a small amount.

5. It is impracticable to entirely eliminate electrolytic action, but by a constant inspection of the water system as a whole, with a view of locating points where difficulty is liable to occur, and applying such remedies as are well known, the danger can be reduced to a minimum.

6. The action at any one point is liable to increase or decrease temporarily from various causes, and tests made at any one locality at any specified time give no reasonable assurance that the same condition of affairs will exist for any considerable length of time.

7. A very small difference in potential, as little as one-thousandth of a volt, will cause electrolytic action.

8. Measurements of small difference of potential between water pipes and the adjacent earth are of value principally in indicating the direction of flow of electric current rather than amount, and are not entirely reliable unless special precautions in measurements are taken.

This is on account of the battery action, thermal effects, and other disturbing influences.

9. The most practical way of reducing the liability of injury to pipes to a minimum is by detecting the places where action is occurring, through a carefully-organized system of inspection and tests, and requiring the railway company to provide suitable return conductors, or make proper connections with pipes or rails, where it is found that such action exists.

10. Special provision can be made for measuring the flow of current from certain pipes to the ground, and, by devices of this sort installed at various places throughout the city, the most reliable information can be obtained in regard to the quantity of current flowing away from the pipes in any particular section, and a determination made of their actual rate of deterioration.

BAD ODORS FROM STORED WATER.

Bad odors from the outfall at Reservoir M of the Croton water system continue to be the subject of complaint. We alluded to this matter in our issue of Aug. 15. Later reports give fuller details, and we quote from the New York "Times" as follows:

Purdy's Station, N. Y., Sept. 8.—The residents of this peaceful little village, lying at the foot of Reservoir M, have been very considerably agitated lately over the malodorous atmosphere which prevails about the reservoir and pervades the inmost recesses of Purdy's dwelling houses.

So obtrusively penetrant has the odor become within the last few weeks that many folk, believing the water to be infected, have closed up the wells from which they procure their drinking water, and some have even been forced to abandon the hamlet as a residence until the atmosphere regains its pristine purity and pleasant odor.

On July 29, the upper gate of the reservoir was pulled up and the great flood of water which had been in process of collecting for a year began to gush down the Titicus, over Isaac Purdy's old saw mill dam, on to the east branch of the Croton, and into New York city, at the rate of 40,000,000 gallons per day. It was then that Purdyites began to sniff their noses and detect in the atmosphere, hitherto redolent with sweet odors from the country side, a smell which seemed to be a combination of everything offensive.

The population being composed in part of New Yorkers, no time was lost in diagnosing the odor. An investigation was begun, and it was soon proved to everybody's satisfaction that the decayed grass in the bottom of the reservoir was exclusively responsible for the odor. Some persons contended that such an "infernal smell' could not be produced by all the decayed grass in Christendom, but that the water in the reservoir, and consequently that in their wells, was contaminated by sewage, which percolated into the reservoir through the various tributaries. Few persons in Purdy's now, however, believe that there is a particle of evidence to substantiate that theory.

Under the Webster act, New York city acquired the right to condemn any property it wished on the Croton watershed, and it has taken advantage of the act to condemn, among other tracts, many acres about Purdy's. Consequently, the reservoir is at the present time far removed from any source of pollution.

Boarding houses and all other buildings in the vicinity have long since been disposed of, and even cows may not be seen for a long distance thereabout. The presence of the decayed grass is looked upon as a necessary evil, and the only desire of Purdy's now is to get Commissioner Brookfield to close the upper gate until cold weather arrives, when they believe the frost will kill the bad odor and both gates may be opened and the bottom of the reservoir thoroughly cleaned.

It was about five years ago that work on Reservoir M was begun, and its completion dates from one year ago. It was built on condemned land on which formerly were gardens, orchards, and dwelling houses, through which meandered a small stream known as the Titicus. The 1,000 acres of land covered by the reservoir were cleared of everything excepting the growth of grass, which was left in most cases intact, or at least was not plowed.

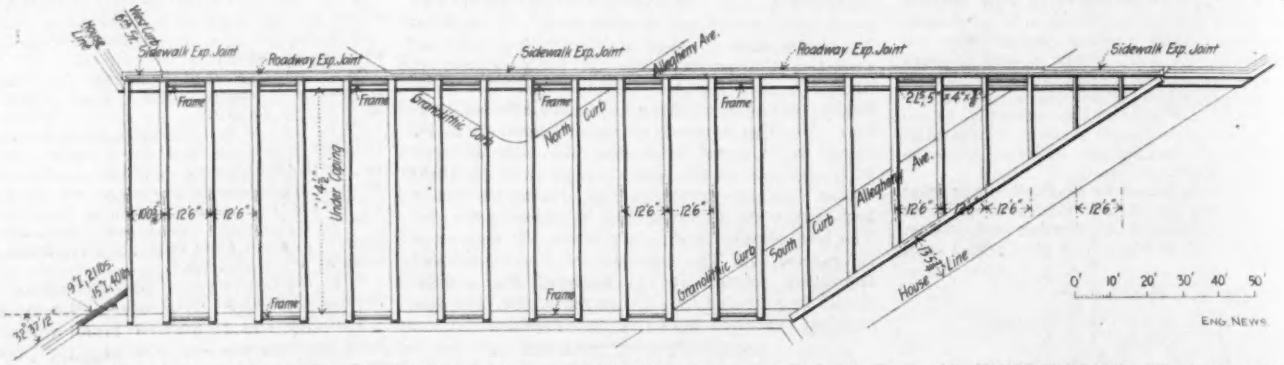
Now it is history in that section of Westchester county known as the Croton Watershed that others of the great basins which disgorge their contents into the Croton pipes have for several years after their completion caused a disagreeable odor on account of the decaying grass in the bottom. Not far away from Reservoir M is the southeast dam, lying between Brewster and Carmel. It "smelled" very badly for several years, and even yet emits some odor, which can be detected when a strong wind blows across the water. The residents thereabouts were very much agitated over the matter, but brought no suits against the city, as some of the Purdyites threaten to do.

As another instance may be cited Sodom Dam, which is two miles from Brewster, and made up of two reservoirs, formerly known as H and I. The atmosphere there became so offensive that Seth Howes was compelled to abandon his almost regal country home there and move to Brewster. Shutting off the water there was out of the question, since that would effectually close all the big milk factories, among which is Gail Borden's New York Condensed Milk Co., and all of which are fed by the 25,000,000 gallons of water flowing each day from the dam. There is hardly a doubt, in view of these examples, that Reservoir A, known as Amawalk, fed by Lakes Mahopac and Kirk, on the Muscoot River, and directly in the line of the New York & Northern R. R., and now in process of completion, will smell the same way when they begin to draw off the water.

On Sept. 9, on representations made by the Board of Health of Purdy's Station, the New York Water Department agreed to close the gates for ten days, in the hope that rains during that time may make further drafts upon the reservoir unnecessary until the water becomes purified. Meanwhile a small weir in the stream, over which the water falls three or four feet soon after it leaves the reservoir, is to be removed, as the bad smell seems to be liberated by the aeration of the water in passing over this weir.

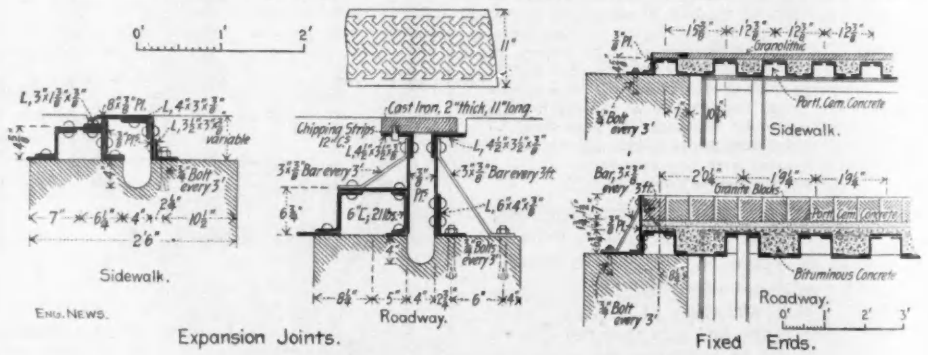
TRANSPORTING A PLATE GIRDER 123 FT. LONG.

The large girder, which is shown in the accompanying illustrations, was built by the Shiffler Bridge Co., of Pittsburg, Pa., for a bridge carrying Sixth St. and Allegheny Ave. over the Port Richmond branch of the Philadelphia & Reading R. R. in Philadelphia. It was designed by the Bureau of Surveys of Philadelphia, of which Mr. George S. Webster, M. Am. Soc. C. E., is Chief Engineer. The general contractors were Messrs. Jones & Pollard, of Baltimore. The necessity for building such a long and heavy girder is due to the fact that the point of intersection of Sixth St. and Allegheny Ave. happened to be at the point where both of these streets crossed the Port Richmond branch. This made it necessary to have a long skew girder on the south side of Allegheny Ave. carrying some eight other girders of varying lengths, the other ends of these girders being carried on the north abutment.



SKETCH PLAN OF BRIDGE OVER PORT RICHMOND BRANCH, PHILADELPHIA & READING R. R., AT INTERSECTION OF ALLEGHENY AVE. AND SIXTH ST., PHILADELPHIA, PA.

As designed and built, the girder is 122 ft. 10¼ ins. long and 9 ft. 6 ins. deep out to out of flange angles. This makes a total depth over the cover plates of rather more than 10½ ft. The shipping weight of the girder was almost exactly 50 tons. As the girder carries a triangular area, the estimated load supported at one end is nearly twice as great as at the other. Hence the girder is not symmetrical, and its center of gravity is not at the middle of its length.



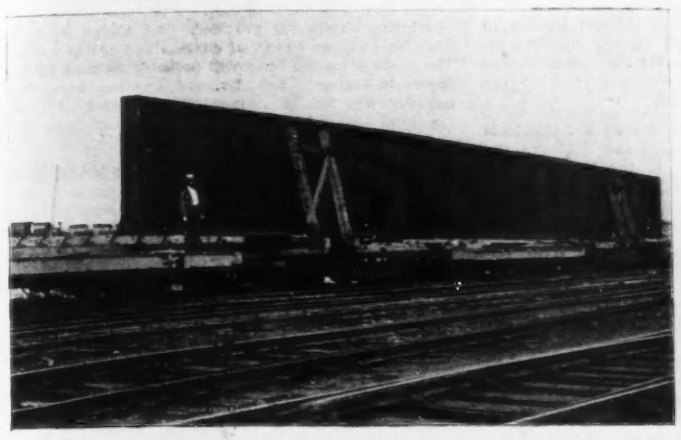
FLOOR OF BRIDGE AND EXPANSION JOINTS.

The girder was shipped in one piece, supported at two points, requiring five cars, three of which—the middle car and the two end cars—were idlers. The cars which supported the girder were gun trucks, and the girder was set on center and side bearings, so as to be free to turn. The gun trucks were heavily counterweighted with pig iron, so as to lower the center of gravity of the car with its load.

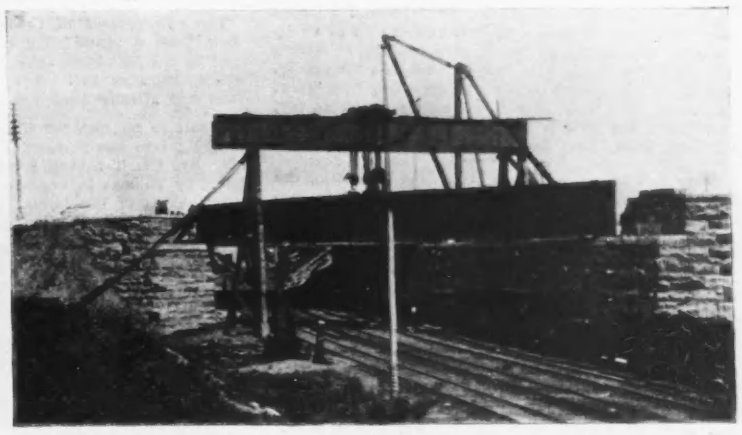
Owing to the unusual height and great length of the girder, it had to be transported over carefully-

selected routes, as curves and clearances would not permit of carrying it over the direct through line. It was therefore hauled from Pittsburg over the West Penn Division of the Pennsylvania R. R. to a junction with the main line near Johnstown, thence over the main line of the Pennsylvania R. R. to Harrisburg, thence over the Lebanon Valley and East Penn railways to Bethlehem, thence down the North Penn Division of the Reading R. R. to a point near the bridge site. It was hauled entirely by daylight and by a special train, and was something like two weeks in transit.

To erect it on the masonry, two girders, which afterward formed part of the bridge, were set



123-FT. PLATE GIRDER LOADED ON CARS FOR SHIPMENT.

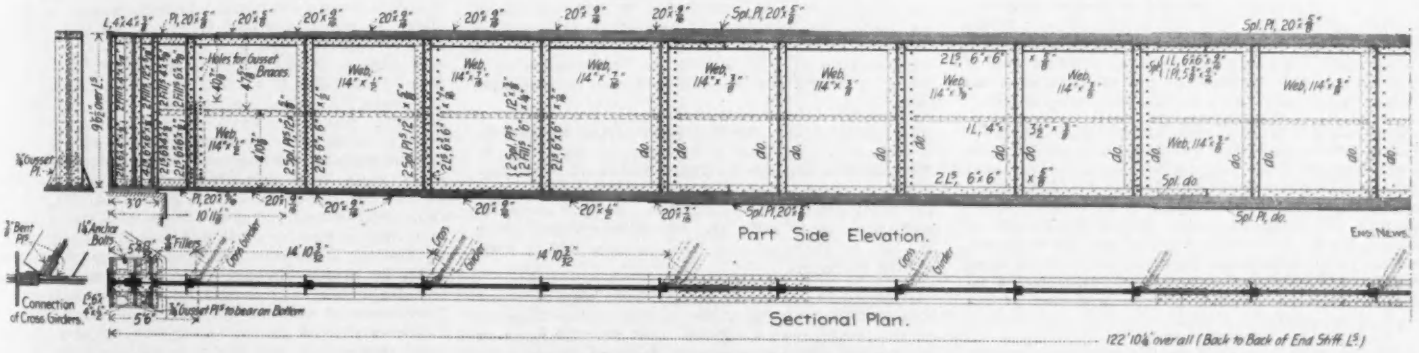


PLACING PLATE GIRDER IN POSITION ON ABUTMENTS.

up on trestles, as shown in the accompanying cut, and on top of them were set nine steel beams, carrying heavy oak blocks, supporting the three tackles by which the girder was lifted. Special stirrups were made to swing the girder in, and their position was carefully fixed by calculating the center of gravity. The blocks used in hoisting are illustrated herewith. In brief, there were three 4-sheaved blocks, and around these were run two lines, with four ends, two fastened and two pulling lines. In raising the girder, the pulling lines were secured to two locomotive engines, and after everything was shipshape and ready for erection, the girder was raised in about 10 minutes' time without difficulty or hitch of any kind. Mr. J. W. Walker, the President of the Shiffler Bridge Co., was on hand with a full staff of assistants, and is to be congratulated on the smooth way in which everything worked. The photographs were furnished us by Messrs. Booth, Garrett & Blair, who made the tests of material and supervised the shopwork and erection of the bridge.

A singular fact about the photographs is that the name of the Shiffler Bridge Co., which was painted on in large letters, does not appear on either picture. This name was painted in heavy black letters, and the girder was painted with red lead. The fact that the name is not visible on the photographs shows that for photographic purposes red and black colors yield equal amounts of light.

The girder is claimed to be the largest ever transported by rail over such a distance.



DETAILS OF 123-FT. PLATE GIRDER.

ENTRANCE REQUIREMENTS AND COURSES OF STUDY IN ENGINEERING SCHOOLS.

At the recent annual meeting of the Society for the Promotion of Engineering Education, a report of a committee on entrance requirements of engineering schools was presented by the chairman, Prof. F. O. Marvin, of the Kansas State University. The committee sent to various colleges and preparatory schools a circular requesting information on the subject, and replies were received from 55 out of 100 engineering schools, and from 148 out of 500 preparatory schools. The substance of the replies was classified in a long series of tables. The chief result obtained by the research was the discovery of the fact that there was an extreme diversity in the character of the entrance requirements of the different colleges. In the West and South the average requirements are very low. Throughout the country, however, there is a manifest tendency to increase the requirements, especially in the direction of a more thorough training in language and other general culture studies. The same subject was treated in a paper by Prof. Louis E. Reber, of the Pennsylvania State College, entitled, "The Present Requirements of American Engineering Schools in Non-Professional Studies." He presented a table showing a comparison of the entrance requirements and of the courses in 37 different colleges. Prof. Reber stated as a conclusion from his investigations that many colleges are giving an incomplete and one-sided education to their students. He urged that the colleges should give a generous proportion of time to general culture. Many colleges, he said, seemed to think that all the time they had was needed for professional training, so that none was left for culture. In the discussion of these papers considerable diversity of opinion was shown as to what amount of culture studies should be given in an engineering course, some holding that the culture training should all be given in the preparatory school and none in the college, while others thought that culture training is a necessity in the college from the fact that but few students come to an engineering college sufficiently educated in general culture. One speaker said that a man's culture training should extend through his whole life, and there was no reason why it should be suspended during the four years in which he is taking a professional course. The table given by Prof. Reber shows that only one college professional course—viz., that for the degree of Electrical Engineer in Columbia College gives no culture training at all, while the other colleges give various amounts, up to 36% of the whole time in the case of the Maine State College.

A test of the comparative merits of three systems of compounding locomotives is to be made by the Pennsylvania R. R., which road is now building three two-cylinder compound mogul locomotives, which will be run in the same service and are alike in every particular, except in the devices for regulating the use of high-pressure steam in the low-pressure cylinder at starting. One engine will have the Lindner starting valve, and the others will have the intercepting valves used by the Pittsburg Locomotive Works and the Richmond Locomotive Works respectively.

Wood pavements are opposed on sanitary grounds in New Orleans. The Board of Health, on July 12, adopted a resolution requesting that the city would forbid the laying of wood as a pavement, either in streets, yards, or on sidewalks. This resolution was referred by the City Council to the City Engineer and Commissioner of Public Works, and these officers have jointly reported that in their opinion wood is not only an unsanitary pavement, but very costly, its maintenance in proper condition being very expensive. They recommend that ordinances be adopted prohibiting the use of wood as a pavement in New Orleans. The city council will probably take action in this matter within the next two or three weeks.

The adoption of electric traction for the Brooklyn Bridge was proposed in a resolution introduced by Mr. Page at the monthly meeting of the Board of Trustees this week. The matter was referred to the Chief Engineer.

The stone roads of Burlington County, N. J., are said to be proving defective, owing to their not being thick enough, the paving disintegrating and forming a surface of loose, rough stones.

The defects in the Harlem speedway, noted in our issue of Aug. 22, have been reported upon by Mr. Charles H. Graham. In the report made by Mr. Crowell it was stated that the character of the river

bottom was not ascertained before letting the contract, but Mr. Graham says that this was on account of the public clamor for the immediate letting of the work as a relief measure on account of the great distress then prevailing. Between High Bridge and Dyckman St. borings were made with iron pipes and sand pumps, but south of High Bridge only rod soundings were made on account of the pressure to get the work started. These soundings showed an apparently hard bottom at 12 to 15 ft. below low water, but this was ultimately found to be a bed of tough peat 2 or 3 ft. thick, underlaid by 15 to 20 ft. of mud in some places.

A consolidation of six of the seven gas companies of Brooklyn, N. Y., has been effected, and the Brooklyn Union Gas Co. has been incorporated, with a capital stock of $15,000,000, to supply gas and electricity. This new company has a controlling interest in the Brooklyn, Citizens', Municipal, Metropolitan, People's and Williamsburg gas companies, and is said to be arranging for control of the Nassau company. Among the directors of the new company are Mr. George W. Young, of the United States Mortgage Co., New York; Mr. Grant B. Schley, of Moore & Schley, 80 Broadway, New York, and John T. Wells, Jr., cashier of the Chase National Bank, New York.

Some fast tunnel work has been done in driving the sewer tunnel at Keokuk, Ia., which is 12 × 12 ft. section and 550 ft. long. The contractor, Mr. Edward L. Smith, is working single shifts, and during the month of July, working 28 ten-hour shifts, he drove 178 ft. of the completed tunnel, with a plant consisting of an Ingersoll-Sergeant air compressor 12 × 12¼ × 14 ins and two 3¼-in. Ingersoll-Sergeant drills mounted on a single screw column used horizontally. Both the heading holes and the bottom holes were drilled with the machines mounted on this bar, no tripods or vertical columns being used. The progress made was 6.4 ft. per shift, and during the last week an average was made of 8.3 ft. per shift for the entire week. The material drilled through was the ordinary stratified limestone found along the Mississippi River, and the record made is considered to be a very good one.

The underground electric system, introduced upon the Lenox Ave. railway in New York city by the General Electric Company in April last, is said to be a pronounced success, and the Metropolitan Traction Co. is credited with having semi-officially made the statement that there is a strong probability that all its lines will be electrically operated within the next five years. The Lenox Ave. road was experimentally equipped and operated, the conduit being arranged to take a cable if the electric power failed. Continuous tests have now shown a hauling capacity fully equal to all demands, and less delay and greater ease of motion than with the cable, and if the statement made be true, evident greater economy in operation. The Lenox Ave. and Washington conduit electric railways were illustrated and described in our issue of March 21, 1895.

The Snaefell electric railway, recently built by the Manx Government, is 4¾ miles long, with a continuous gradient of 1 in 12, or 8.33%. It extends from Laxey to the summit of Snaefell, 2,000 ft. above sea level. It has a center rail with emergency-grip brakes especially devised for this line. On the recent official test the descending car was brought to a standstill by these brakes within its own length with an ordinary load of passengers. The engineers of the railways, says the London "Architect," were Messrs. McKerrow & Fell.

The utilization of the Great Falls of the Potomac for electric power producing purposes is apparently assuming definite shape. A wealthy Northern capitalist, represented by Mr. Horace S. Cummings, of Washington, D. C., is reported as being actively engaged in developing this enterprise. Mr. Joseph P. Frizell, of Boston, Mass., was lately engineer for the company, and his plans, prepared a year ago, seem to be those adopted. We publish an abstract of Mr. Frizell's report showing the location, purpose and cost of the proposed enterprise.

"Charity rides," on open electric cars have been instituted by the West End Ry. Co., of Boston. The company recently sent to the Mayor of the city 20,000 tickets for distribution among the charitable institutions of the city, to enable the inmates to enjoy a ride to the suburbs of the city on the electric cars.

No intramural railway will be built at the Cotton States and International Exhibition, at Atlanta, Ga., on account of the number of grade crossings, but a roadway of 2-in. plank, 18 ft. wide, will be built along the main avenues, reaching all the principal buildings, and on this will be run large herdics or carriages holding about 18 passengers each.

A small underground cable railway for carrying books is being built in Washington to connect the Capitol with the new Congressional Library. The distance is 1,275 ft The conveyor is an endless wire cable carrying two book holders, and it runs in a tunnel 4 × 6 ft., located from 3 to 5 ft. under ground. Its chief purpose will be to serve the convenience of members of Congress who will order books from a small room on the main floor of the Capitol by telephone.

The best way to prevent smoke in Western cities, according to the experience of Chicago, is by a good smoke ordinance rigidly enforced. Pittsburg is going to try this plan on and after Oct. 1. The ordinance provides a fine of not less than $10 or more than $50 for every escape of smoke lasting more than three minutes. It was passed about three months ago, and ample warning of the date of its going into operation has been given, but thus far very few of the firms who are producing smoke have made any preparation for putting in smoke consumers.

The enlargement of the Grand Central station in New York is again being talked of, but delay in acquiring the necessary land prevents any definite steps being taken as yet. A considerable portion of the land has already been purchased.

A suit to restrain the Great Northern Ry. Co. from entering into the reorganization of the Northern Pacific Ry. Co. has been brought in the U. S. Circuit Court by Thomas B. Pearsall, of New York, who owns 5,000 shares in the former company. The matter of the proposed consolidation was discussed in our issue of Aug. 8.

The Nebraska Irrigation Board was organized in May last with Mr. R. B. Howell as State Engineer and Secretary, and Mr. W. R. Akers as Assistant Secretary. Transcripts of claims filed with county clerks previous to April 4, 1895, when the present law went into effect, show that there were 789 claimants of water rights on that date. Returns so far made to the board show 372 irrigation canals completed or under construction in the state on April 4, 1895, with a total length of 1,908 miles, of which 1,156 miles are completed. The estimated total cost is $2,915,336, of which $1,271,808 has already been expended. These canals will irrigate 866,180 acres, of which 43,570 acres were planted to crops in 1894, and 132,000 acres bear crops the present year. These canals cost a little over $2 per acre under ditch. Besides the above work, there is a large mileage of existing canals returns for which have not yet been made to the board; and claims have been filed for projected work comprising 956 miles of canal, estimated to cost $3,500,000 and to water 1,067,294 acres. The offices of the board are at Lincoln.

The Nebraska irrigation law is to be tested in the courts. This state, like Oregon, Washington, Utah, Kansas and North and South Dakota, has irrigation laws modeled on the Wright law of California, which was recently declared unconstitutional by Judge Ross, of the United States District Court. In consequence the validity of bonds issued by irrigation districts in these states is being called in question, and a final decision upon the question is wished for by all parties at the earliest possible date.

An inspection of the Grand Trunk Ry. is being made by Sir Charles Rivers Wilson, the new president of the company, who is accompanied by other officers of the road. This inspection is part of an investigation and examination of the whole system of the road and its management, with a view to the adoption of a policy which will put the road on a more remunerative basis.

An experimental irrigating plant taking water from a deep well has been established at Goodland, in Western Kansas, by the State Board of Irrigation. Water is pumped from a well about 166 ft. deep, but the exact lift is not stated. The pumping engine is said to be of 10 HP., net, the pump cylinder being 5½ ins. in diameter and 36-in. stroke, lifting 6,000 gallons an hour.

Irrigation in Illinois is said to have been practiced with gratifying results at the Eastern Illinois Hospital for the Insane, near Kankakee. Last year the crops on the asylum farm were greatly damaged by drought. This year the crops have been irrigated with water pumped from the Kankakee River by the regular pumping plant of the institution. Potatoes, turnips, cabbages, peas and other crops are being successfully raised this year under irrigation, according to the Chicago "Farmer." Some fruit is also under irrigation. The 10-in. supply main for the institution was tapped by a 6-in. pipe 1,200 ft. in length, leading to the highest point of the land to be irrigated. From this supply main 2,000 ft. of 4 and 800 ft. of 3-in. pipe extend, connecting with furrow ditches. It is said that the plant is attracting much attention from the surrounding farmers.

A sewage disposal plant and sewage farm have been put in operation at Eccles, England, dealing with the sewage from a population of 31,000. The daily amount of sewage is about 1,000,000 gallons, of which 20 to 25% is refuse from factories and dyeing plants, and a 36-in. outfall sewer conveys this to a farm of 71¼ acres about one mile from the town. After passing through a screen the sewage is pumped to a basin where chemical precipitation may be effected, although at present it is intended to dispense with this. From the basin the sewage flows to the settling tanks, 30 ft. square and 6 to 8 ft. deep, and then to two other tanks, 120 × 60 ft., fitted with cross walls. The capacity of the four tanks is 650,000 gallons. The effluent flows in a thin sheet over an overflow sill and is carried by 18 to 24-in. glazed stoneware pipes to the several irrigation plots, where it is stored in brick chambers and distributed by means of sluice valves. The farm is divided into 28 lots of 0.5 to 4.5 acres, and the drains are laid on the herring-bone plan. The soil is of sand and loam, with the underdrains laid at a depth of 3.5 to 5 ft., and 6-in. vertical ventilating shafts are provided. The sludge is led to filter beds having 30 ins. of clinkers and coarse cinders. The crops from the farm will probably be used for the horses belonging to the city, and also for cattle. The engineer was Mr. H. Leonard Hinnell, of Bolton, and the total cost of the works, exclusive of land, was about $90,000.

The Health Department of Chicago has been recently examining the condition of the lake water contained in the city mains. While none of the samples taken from five different sections of the city were found to be absolutely pure, four of them were marked "usable." That from the Hyde Park intake, however, was reported as "bad, full of bacteria, and should be boiled thoroughly before being used." The water from Wolf Lake, from which one of the large Chicago ice companies takes its ice, was also reported as bad.

Asphalt pavement is cleaned at Minneapolis, Minn., by a tool which resembles a large dust pan with a long handle carried on two wheels at the back. The bottom almost touches the surface and by tilting the handle slightly the thin front edge takes up the dirt, manure or thin film of mud. The man pushes this pan before him and has an ordinary long-handled broom which he works with one hand to sweep into the pan any dirt which is not readily picked up.

The preservation of the Palisades of the Hudson River is now in the hands of a joint commission appointed by the governors of New York and New Jersey. This commission includes, for New York, Enoch C. Bell, Waldo G. Morse and J. J. R. Croes, and for New Jersey, H. D. Winton, E. B. Meaney and C. B. Thurston. The legislature of New Jersey has already enacted a law requiring the Riparian Commissioners of the state to insert in any grant of land along the Hudson River a provision forbidding any mutilation or encroachment upon the vertical face of the cliff. The joint commission named above is to devise plans for inducing the United States to acquire the Palisades and to convert them into a national park and reservation. The incentive for the proposed action is the rapid mutilation of portions of these picturesque cliffs for the purpose of marketing the trap-rock composing them as paving stone and ballast. The Commission recently visited the ground and found extensive quarries in full operation at a number of points between Hoboken and Haverstraw. The territory on top of the cliff is now practically inaccessible for building purposes. The rock is scantily covered with earth and slopes to the westward from the face of the cliffs in undulations, which retain water and make the ground swampy, unhealthy and difficult to drain. The law appointing the Commission requires them to consider the availability of this territory "for the purposes of fortification." The Commission naturally finds little or no value in the site for this purpose for the protection of New York city. It is suggested, however, that the lower end would be an excellent location for a military post and headquarters. By building a military road along the summit of the cliffs, 50 to 100 ft. back from the face, the scenic beauties would be preserved by reserving only about 1,500 acres of land in all. By this arrangement a minimum of land would be required for any government reservation, and the property abutting on the west of this road would be made more valuable than at present.

Two big kites on one string are to be flown to a height of two miles, if possible, by Prof. McAdie, meteorologist of the weather bureau, at Washington, for the purpose of making observations of temperatures, pressures, etc., and of the direction of the various air currents in the upper atmosphere. Two of these kites are to be 6 ft. high and 7 ft. wide, and the 8 following will be 5 ft. high by 6 ft. wide. The kites are of the Malay, or tailless variety, and the largest weighs 1¼ lbs. They will carry self-registering thermometers, barometers, etc., and their heights will be ascertained by a surveyor's transit. In most of the experiments the kites will be kept in the air, if possible, for twelve hours.

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PERSONALS.

Mr. John H. Sample has been appointed General Superintendent of the Northern Ohio R. R., with offices at Akron, O.

Mr. F. H. Peters, of Houston, Tex., has resigned his position as Chief Engineer of the Galveston, Laporte & Houston Ry.

Mr. H. O. Dunkle has been appointed Superintendent of the Pittsburg & Western R. R., with offices at Allegheny, Pa.

Mr. Horatio N. Howard, who died at Elizabeth, N. J., Sept. 3, was engaged in the engineering service of the Pennsylvania R. R.

Mr. Loyall A. Osborne, M. E., has been appointed Assistant Superintendent of the Westinghouse Electric & Mfg. Co., with headquarters at Pittsburg, Pa.

Mr. Henry H. Bentley, electrician, and President of the Philadelphia Local Telegraph Co., died Sept. 8 at Stanford Heights, near Rhinebeck, N. Y., at the age of 64.

Mr. Lester A. Scofield, of Richmond, N. Y., Chief Engineer of the Mallory Steamship Line, and one of the Sewer Commissioners of Richmond, died Sept. 3, at the age of 66.

Mr. C. H. Middleton has been appointed Assistant Chief Engineer of the Denver & Rio Grande R. R., with office in Denver, Colo., under Mr. M. H. Rogers, Chief Engineer.

Mr. W. L. Cameron has been appointed Chief Engineer of the water-works at Kansas City, Mo., which have been acquired by the city from the National Water-Works Co.

Mr. F. R. Hasley, of Marinette, Wis., has gone to Colombia to make the survey for a railway from the Magdalena River to some gold and silver mines owned by an English company.

Mr. Alphonse Fteley, M. Am. Soc. C. E., and Mr. Joseph P. Davis, M. Am. Soc. C. E., have been appointed Consulting Engineers to the Metropolitan Water Board, of Boston, Mass.

Mr. Joseph B. Carper, of Gala, Va., a graduate of the Virginia Agricultural and Mechanical College, has accepted a position as assistant engineer with the South African Diamond Mining Co.

Mr. L. S. Rose, who has been appointed Roadmaster of the Central Vermont R. R., was formerly Assistant Engineer of Maintenance of Way on the Cleveland, Cincinnati, Chicago & St. Louis Ry.

Mr. J. E. Melick, who built the Rockaway Valley R. R. and was in 1887 appointed engineer to inspect the Union Pacific and Central Pacific railways for the government, is now President of the Whippany River R. R., with offices at Morristown, N. J.

Mr. C. H. Roser has been appointed Superintendent of the Ohio Southern R. R., with office at Cleveland, O. He succeeds Mr. J. H. Barrett, who will remain as General Superintendent of the Cleveland, Akron & Columbus Ry., having formerly been in charge of both roads.

Mr. Robert Gillham, M. Am. Soc. C. E., has been appointed Chief Engineer of the Kansas City, Pittsburg & Gulf R. R., with office at Kansas City, Mo. He succeeds Mr. Richard Gentry, who has resigned. Mr. Gillham was formerly Chief Engineer of the Metropolitan Street Ry. Co., of Kansas City.

Maj. A. N. Damrell, U. S. Engineer Corps, has been ordered to Portland, Me., relieving Lieut.-Col. D. P. Heap, who is transferred to Wilmington, N. C. He relieves Maj. Wm. S. Stanton, who is ordered to duty at Oswego, N. Y., relieving Capt. D. C. Kingman, who is ordered to duty at Chattanooga, Tenn.

Mr. E. M. Norris, Jun. Am. Soc. C. E., has been appointed Superintendent and Mechanical Engineer of the Riehle Bros. Testing Machine Co., of Philadelphia, Pa. He succeeds Mr. C. E. Buxby, who has been Superintendent for several years, and who will act as Consulting Engineer for the company.

Mr. Robert Blickensderfer, who was at one time Superintendent of the Idaho Division of the Union Pacific R. R., has been appointed General Superintendent of the Wheeling & Lake Erie R. R., with headquarters at Toledo, O., succeeding Mr. C. A. Wilson, who will continue to hold his position as Chief Engineer.

Maj. Ernest H. Ruffner, U. S. Engineer Corps, now located at Buffalo, N. Y., and Capt. Thomas W. Symons, now at Portland, Ore., will exchange posts. Maj. G. D. Knight will relieve Capt. William T. Roswell, at Willets Point, who will then proceed to Mobile, Ala.; First Lieut. W. E. Craighill will report for duty at Willets Point.

Mr. B. C. Millner, Jr., who for the past year has been in charge of the civil engineering work of the Cotton States & International Exhibition, at Atlanta, Ga., under Mr. Wilkins, has been appointed Assistant to Major C. H. Hudson, Chief Engineer of the Southern Ry. He was formerly Chief Engineer of the Georgia Southern & Florida R. R.

The firm of Fisher & Porter, of Chicago, Ill., will be dissolved on Sept. 30. Mr. Albert Fisher will retain the present office at 1025 Monadnock Block, and will represent Wm. Todd & Co., of Youngstown, O., on their high-grade and heavy-duty engines, rolling mill and blast-furnace machinery. Mr. H. F. J. Porter will retain the agency of the Bethlehem Iron Co, and will move to Room 1433 Marquette Building.

Maj. J. G. D. Knight, U. S. Engineer Corps, has been appointed commander of the battalion of engineers at Willets Point, to succeed Lieut.-Col. William King, who was transferred to Rock Island, Ill., several months ago. Since Colonel King's departure Capt. Wm. T. Rossell has been temporarily in command of the battalion, and he has now been detailed to take charge of the works at Mobile, Ala.

Mr. E. L. Ingram, Assoc. M. Am. Soc. C. E., has opened an office in the D. S. Morgan Building, Buffalo, N. Y., and will carry on a general practice in civil engineering. He was Principal Assistant Engineer in the location and marking of the boundary line between the United States and Mexico throughout the three years this important work was in progress, and was for 10 years engaged on river, harbor and coast work of all kinds, under the U. S. War and State departments. He graduated from Columbia College in 1885.

Mr. Daniel Coxe, of Drifton, Pa., who died Sept. 6, was a son of Mr. Alexander B. Coxe, and nephew of the late Mr. Eckley B. Coxe. He was Superintendent of the Delaware, Susquehanna & Schuylkill R. R., and was carrying on much of the work outlined by his uncle for the benefit of the mining community of Drifton and the neighborhood. On Sept. 6 he was riding on the engine of a little narrow-gage railway between his home at Drifton and the town of Freeland, when the engine was derailed at a road crossing and went down the bank. Mr. Coxe did not appear to have been injured, but died of heart failure soon after reaching home.

ENGINEERING SOCIETIES.

COMING TECHNICAL MEETINGS.

NORTHWESTERN TRACK AND BRIDGE ASSOCIATION.
Sept. 13. Secy., D. W. Meeker, St. Paul, Minn.
INDIANAPOLIS ENGINEERING CLUB.
Sept. 14. Secy., C. C. Brown, City Engineer.
MONTANA SOCIETY OF CIVIL ENGINEERS.
Sept. 14. Secy., Forrest J. Smith, Denver Block, Helena, Mont.
ENGINEERS' CLUB OF MINNEAPOLIS.
Sept. 16. Secy., E. Nexson, Kasota Block.
NATIONAL IRRIGATION CONGRESS.
Sept. 16 to 19. At Albuquerque, N. Mex. Secy., Fred L. Alles, Los Angeles, Cal.
AMERICAN SOCIETY OF IRRIGATION ENGINEERS.
Sept. 16 to 19. At Albuquerque, N. Mex. Secy., John S. Titcomb, Denver, Colo.
COLUMBIAN ENGINEERING SOCIETY.
Sept. 17. Secy., W. F. Hart, University Building, 15th and H Sts. N. W., Washington, D. C.
WESTERN RAILWAY CLUB.
Sept. 17. Secy., W. D. Crosman, Rookery Bldg., Chicago.
AMERICAN SOCIETY OF CIVIL ENGINEERS.
Sept. 18. "High Masonry Dams," by John D. Van Buren. Secy., C. W. Hunt, 127 E. 23d St., New York city.
ENGINEERS' CLUB OF ST. LOUIS.
Sept. 18. "Maintenance of Bridges," by C. Gayler. Secy., W. H. Bryan, Turner Block.
ENGINEERS AND ARCHITECTS' ASSOCIATION OF SOUTHERN CALIFORNIA.
Sept. 18. Secy., F. Van Vleck, Los Angeles, Cal.
BOSTON SOCIETY OF CIVIL ENGINEERS.
Sept. 18. Secy., S. E. Tinkham, City Hall, Rooms 36, Bromfield St.
ASSOCIATION OF ENGINEERS OF VIRGINIA.
Sept. 18. Secy., J. A. Pilcher, Roanoke, Va.
NEW ENGLAND ROADMASTERS' ASSOCIATION.
Sept. 18, 19. At the Revere House, Boston, Mass. Secy., M. C. Hamilton, Hartford, Conn.
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.
Sept. 18. Secy., R. W. Pope, 26 Cortlandt St., New York.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.
Sept. 19. Secy., D. Carhart, Carnegie Library Bldg., Allegheny.
ENGINEERS' CLUB OF CINCINNATI.
Sept. 19. Secy., J. F. Wilson, Odd Fellows' Temple.
NEW YORK RAILROAD CLUB.
Sept. 19. Secy., John A. Hill, 256 Broadway, N. Y.
INTERNATIONAL DEEP WATERWAYS ASSOCIATION.
Sept. 24, 25, 26. Annual convention, at Cleveland, O. Vice-Pres., L. E. Cooley, Chicago, Ill.
WISCONSIN POLYTECHNIC SOCIETY.
Sept. 24. Secy., W. K. Means, Loan & Trust Bldg., Milwaukee.
ENGINEERING ASSOCIATION OF THE SOUTH.
Sept. 26. Secy., H. D. Ruhm, Nashville, Tenn.
AMERICAN SOCIETY OF RAILROAD SUPTS.
October. Annual meeting at New York. Secy., C. A. Hammond, 143 Liberty St., New York.
WESTERN SOCIETY OF ENGINEERS.
Oct. 2. Secy., Chas. J. Roney, 1736 Monadnock Block, Chicago, Ill.
TECHNICAL SOCIETY OF THE PACIFIC COAST.
Oct. 4. Secy., O. H. Von Geldern, 819 Market St., San Francisco.
ENGINEERING CLUB OF COLUMBUS, O.
Oct. 5. Secy., David Buell.
ENGINEERS' CLUB OF PHILADELPHIA.
Oct. 5. Secy., L. F. Rondinella, 1122 Girard St.
AMERICAN INSTITUTE OF MINING ENGINEERS.
Oct. 8. At Atlanta, Ga. Secy., R. W. Raymond, New York, N. Y.
ROADMASTERS' ASSOCIATION OF AMERICA.
Oct. 8. At St. Louis, Mo. Secy., W. W. Sharpe, Waycross, Ga.
CIVIL ENGINEERS' CLUB OF CLEVELAND.
Oct. 8. Secy., F. A. Coburn, Case Library Building.
DENVER SOCIETY OF CIVIL ENGINEERS.
Oct. 8. Secy., H. Breen, 36 Jacobson Block.
NORTHWEST RAILWAY CLUB.
Oct. 8. Secy., G. A. Seley, 80 Metropolitan Block, St. Paul, Minn.
NORTHWESTERN SOCIETY OF ENGINEERS.
Oct. 8. Secy., D. W. McMorris, Burke Bldg., Seattle, Wash.
NEW ENGLAND RAILROAD CLUB.
Oct. 9. Secy., F. M. Curtis, P. O. Box 1576, Boston, Mass.
CANADIAN SOCIETY OF CIVIL ENGINEERS.
Oct. 10. Secy., C. H. McLeod, Montreal.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.
Oct. 10. Secy., G. L. Annan, City Engineer's Office.
ENGINEERING SOCIETY OF WESTERN NEW YORK.
Oct. 10. Secy., Geo. R. Sikes, 122 Pearl St., Buffalo, N. Y.
ENGINEERS AND ARCHITECTS' CLUB OF LOUISVILLE.
Oct. 10. Secy., Jas. K. Zollinger, Norton Building.
ENGINEERS' CLUB OF KANSAS CITY.
Oct. 14. Secy., F. W. Tuttle, Baird Building.
AMERICAN INT. ASSOC. OF RY. SUPTS. OF BRIDGES AND BUILDINGS.
Oct. 15. At New Orleans, La. Secy., S. F. Patterson, Boston & Maine R. R., Concord, N. H.
AMERICAN STREET RAILWAY ASSOCIATION.
Oct. 15. At Montreal, Que. Secy., John N. Partridge, Brooklyn, N. Y.
AMERICAN INSTITUTE OF ARCHITECTS.
Oct. 15, 16, 17. Annual convention, at St. Louis, Mo. Secy., Alfred Stone, Providence, R. I.
AMERICAN RAILWAY ASSOCIATION.
Oct. 16. At New York. Secy., W. F. Allen, 24 Park Place, New York.
CENTRAL RAILWAY CLUB.
Nov. 8. Secy., H. D. Vought, Buffalo, "Courier," Buffalo, N. Y.
SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.
Nov. 21. Secy., C. A. Charpiot, Macon, Ga.

WESTERN SOCIETY OF ENGINEERS.—At a meeting of the Society, held Aug. 28, the question of withdrawal from the Association of Engineering Societies was discussed at some length. It was voted that two committees should be appointed, one to present arguments in favor of withdrawal and the other arguments against withdrawal, and that these arguments should be submitted to the members of the Society together with letter ballots for vote on the question. The advocates of the movement for withdrawal base their action on the necessity of reducing the publishing expenses now coming upon the Society through its connection with the Journal of the Association of Engineering Societies.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—At the first meeting of the season, on Sept. 4, with the President, Mr. Geo. S. Morison, in the chair, the secretary read a paper on "A High-Speed Gravity Filter Bed," by A. McL. Hawks. The paper described an upward-flow sand filter built for temporary service at Tacoma, Wash., the water being aerated by passing along a flume, and iron (in the form of horseshoes) being placed in the flume to act as a coagulant. The filter was built very cheaply and rapidly, and was worked at a rate of 500 to 1,000 gallons per sq. ft. per day, although the usual rate for such filter beds is about 50 gallons. The plant was only operated for a very short time and no observations or tests were made as to the filtering effect upon the water.

In the written discussions presented, Mr. Allen Hazen pointed out that the use of sand of large grain in order to allow for such rapid flow materially reduced the efficiency of the filter, and he did not think that the iron could have been of any use as a coagulant in this case. Mr. S. B. Russell pointed out that the time of the test was far too limited to allow of any definite conclusion. Mr. John W. Hill thought it doubtful if the results obtained, mainly a partial clarification of the water, warranted even the small outlay recorded, and high speed cannot be combined with high efficiency in filtering. The general opinion evinced by the discussion appeared to be that it was doubtful whether the plant really acted as a filter, but that it probably acted mainly as a strainer for the larger impurities.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.—The annual meeting of this Society was held at Springfield, Mass., on Sept. 2, 3 and 4. It was well attended by engineering professors from all parts of the country, about 50 being present at some of the sessions. Many of the papers were highly interesting, and the discussions were spirited, evincing in some cases great differences of opinion. Prof. Geo. F.

Swain, of the Massachusetts Institute of Technology, presided, and Prof. J. B. Johnson, of Washington University, St. Louis, was Secretary. The following is a list of the papers read. They will be printed in a volume which will be published by the Society: "Entrance Requirements." Report of Committee, with Discussion. F. O. Marvin. "The Scope of an Engineering School, with especial reference to its assuming duties now left to the Preparatory Schools, and extending its course on the other hand to include post graduate work," Wm. G. Raymond. "The Present Requirements of American Engineering Schools in Non-Professional Studies," Louis E. Reber. "Culture Studies in Engineering Schools—Languages, History, Political Science," E. A. Fuertes. "Mathematics. What should be taught in the Undergraduate Course, and What Left to the Post Graduate Period," C. P. Brackett. "Graphical Methods in General. How far Taught," L. M. Hoskins. "Text-Books, Specifications for," I. O. Baker. "The True Place of Drawing and Shop-work in Engineering Schools," C. H. Benjamin. "Graduation, Theses, and Degrees," Storm Bull. "Modified Requirements for Graduation of Students who have taken full Literary College Courses," Ira N. Hollis. "Comparative Value of Graduate Study in Engineering Courses," W. H. Burr. "The Economic Element in Technical Education," L. S. Randolph. "Unsymmetrical Development of the Various Courses in Engineering Schools," F. R. Hutton. "The Engineer of the Twentieth Century," E. L. Corthell. "A Course of Study in the Physical Sciences": Physics, C. T. Mees; Mechanics, R. S. Woodward; Astronomy, G. C. Comstock; Biological Studies for Engineers, C. W. Hall. "Professional Studies—Subjects to be treated and time to be given to each": Civil Engineering, C.L. Crandall; "Sanitary Engineering," Chas. C. Brown, City Engineer, Indianapolis, Ind. "Geodetic Engineering," Mansfield Merriman, Lehigh University, Bethlehem, Pa. "Mechanical Engineering," H. W. Spangler. "Electrical Engineering," D. C. Jackson. "Teaching Industrial Applications of Electricity," Geo. D. Shepardson. "Mining Engineering," Regis Chauvenet. "Mining Engineering Laboratories," H. O. Hofman. "A Course of Instruction in Engineering Materials," J. B. Johnson.

The following officers were elected for the ensuing year: President, Mansfield Merriman, Lehigh University; Vice-Presidents, F. O. Marvin, University of Kansas, and Cady Staley, Case School of Applied Science; Secretary, C. Frank Allen, Massachusetts Institute of Technology; Treasurer, J. J. Flather, Purdue University.

The next meeting will be held at Buffalo, N. Y., beginning Aug. 20, 1896. There is now little doubt that this Society will have a great and lasting influence in shaping the development of engineering education in the United States.

CONSTRUCTION NEWS.

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Sept. 13.	Cement, castings, etc.,	Washington.	Aug. 15
	Advertised, Eng. News, Aug. 15 to Sept. 5.		
Sept. 13.	Plumbing, etc.,	Philadelphia, Pa.	Aug. 15
Sept. 13.	Improving street,	Defiance, O.	Aug. 29
Sept. 13.	Pipe sewers (5½ miles),	Madison, Wis.	Aug. 29
Sept. 13.	Road in Cortlandt township,	N. Y.	Aug. 29
Sept. 13.	Reservoir,	Austin, Tex.	Aug. 29
Sept. 13.	Steel bridge,	Dunkerhook, N. J.	Sept. 5
Sept. 13.	Grading,	Brooklyn, N. Y.	Sept. 5
Sept. 13.	Riprap work, etc.,	Swinburne Island.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 13.	Water-works exten's,	Niagara Falls.	Sept. 5
	Advertised, Eng. News, Sept. 5.		
Sept. 13.	Rebuilding 2 steel bridges,	Easton, Pa.	Sept. 5
Sept. 13.	Stone bridge abutments,	Manteno, Ill.	Sept. 5
Sept. 13.	Macadamizing, etc.,	St. Louis, Mo.	Sept. 5
Sept. 13.	Resurfacing streets,	Paterson, N. J.	Sept. 5
Sept. 13.	Belgian block paving,	Brooklyn, N. Y.	Sept. 5
Sept. 13.	Brick paving,	Jackson, Mich.	Sept. 12
Sept. 14.	Plans for library bldg.,	Madison, Wis.	July 18
Sept. 14.	Bridge,	Columbus, O.	Aug. 29
Sept. 14.	Steel bridge,	Denver, Colo.	Aug. 29
Sept. 14.	Court house,	Warren, O.	Aug. 29
Sept. 14.	Brick paving,	St. Joseph, Mich.	Aug. 29
	Advertised, Eng. News, Aug. 20 to Sept. 12.		
Sept. 14.	Water-works system,	Hempstead, N. Y.	Aug. 29
	Advertised, Eng. News, Aug. 29 and Sept. 5.		
Sept. 14.	Asphalt pav'g,	Governor's Island, N. Y.	Sept. 5
Sept. 14.	County jail,	New Haven, Conn.	Sept. 12
Sept. 14.	Brick sewer, etc.,	Altoona, Pa.	Sept. 12
Sept. 14.	Paving,	Turtle Creek, Pa.	Sept. 12
Sept. 14.	Macadam road,	Guilford, Conn.	Sept. 12
Sept. 14.	Pipe sewers,	Central Falls, R. I.	Sept. 12
Sept. 14.	Pipe sewers (21,000 ft.),	Port Huron.	Sept. 12
Sept. 14.	Macadam road,	Newington, Conn.	Sept. 12
Sept. 14.	Macadamizing,	Waterford, Conn.	Sept. 14
Sept. 14.	Sidewalks, etc.,	Madison, Wis.	Sept. 12
Sept. 15.	Electric railway,	Cleveland, O.	Aug. 22
Sept. 15.	School buildings,	Bozeman, Mont.	Aug. 29
Sept. 16.	Pumping engines,	Youngstown, O.	Aug. 22
	Advertised, Eng. News, Aug. 22.		
Sept. 16.	Y. M. C. A. building,	Galveston, Tex.	Aug. 29
Sept. 16.	Electric light plant,	Osborn, O.	Aug. 29
	Advertised, Eng. News, Aug. 29.		
Sept. 16.	Water-works system,	Osborn, O.	Aug. 29
	Advertised, Eng. News, Aug. 29.		
Sept. 16.	Stand-pipe,	Somersworth, N. H.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 16.	Laying water pipe,	Somersworth, N.H.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 16.	Lead pipe,	Syracuse, N. Y.	Sept. 5
	Advertised, Eng. News, Sept. 5.		
Sept. 16.	Laying water pipe,	Westwood, O.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 16.	Cast iron pipe,	Westwood, O.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 16.	Telephones, etc.,	Washington, D. C.	Sept. 5
Sept. 16.	Dredging (300,000 cu. yds.),	Baltimore.	Sept. 5
	Advertised, Eng. News, Sept. 5.		
Sept. 16.	School building,	Parkersburg, W. Va.	Sept. 5
Sept. 16.	School building,	Glenville, O.	Sept. 5
Sept. 16.	Fire engine house,	Binghamton, N. Y.	Sept. 5
Sept. 16.	Paving,	Terre Haute, Ind.	Sept. 5
Sept. 16.	Pumping mach'y,	Somersworth, N. H.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 16.	Boilers,	Somersworth, N. H.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 16.	Paving,	Syracuse, N. Y.	Sept. 12
Sept. 16.	Block paving,	Ansonia, Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 16.	Armory building,	Walton, N. Y.	Sept. 12
Sept. 16.	Hospital building,	Binghamton, N. Y.	Sept. 12
Sept. 16.	Asylum buildings,	Wernersville, Pa.	Sept. 12
Sept. 16.	Brick sewers,	Syracuse, N. Y.	Sept. 12
Sept. 16.	Sewers,	Rochester, N. Y.	Sept. 12
Sept. 16.	Brick sewers,	Toledo, O.	Sept. 12
Sept. 16.	Sewer materials,	Fresno, Cal.	Sept. 12
Sept. 16.	Pipe sewers,	Albany, N. Y.	Sept. 12
Sept. 16.	Sewers,	New York, N. Y.	Sept. 12
Sept. 16.	Rebuilding bridge,	Kansas City, Kan.	Sept. 12
Sept. 16.	Macadam road,	Norwich, Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 16.	Paving (4 contracts),	New York, N. Y.	Sept. 12
Sept. 16.	Brick paving,	Chester, Pa.	Sept. 12
Sept. 16.	Cedar block paving,	Oshkosh, Wis.	Sept. 12
Sept. 16.	Stone arch bridge,	Syracuse, N. Y.	Sept. 12
Sept. 16.	Bridge,	Paterson, N. J.	Sept. 12
Sept. 17.	Water-works franchise,	Rushville, Ind.	Aug. 15
	Advertised, Eng. News, Aug. 8 to 22.		
Sept. 17.	Water-wks system,	Armstrong, Ia.	Aug. 22
	Advertised, Eng. News, Aug. 22.		
Sept. 17.	Removal of wreck,	Washington, D. C.	Aug. 22
Sept. 17.	Paving,	Dunkirk, N. Y.	Aug. 29
	Advertised, Eng. News, Aug. 29 and Sept. 5.		
Sept. 17.	Brick sidewalks,	Decatur, Ind.	Aug. 29
Sept. 17.	Road,	Groton, Conn.	Sept. 5
Sept. 17.	Cast iron pipe, etc.,	St. Louis, Mo.	Sept. 5
Sept. 17.	Laying water mains,	St. Louis, Mo.	Sept. 5
Sept. 17.	Levees (700,000 cu. yds.),	Memphis.	Sept. 5
Sept. 17.	Water-works system,	Culpeper, Va.	Sept. 5
Sept. 17.	Resetting boilers,	Jersey City, N. J.	Sept. 12
Sept. 17.	Water mains (20 streets),	Chicago, Ill.	Sept. 12
Sept. 17.	Water pipe for Hawaiian Government.		Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 17.	Macadamizing,	Rocky Hill, Conn.	Sept. 12
Sept. 17.	Plans for stand-pipe,	So. Milwaukee.	Sept. 12
Sept. 17.	Ditch work,	St. Paul, Minn.	Sept. 12
Sept. 17.	Addition to school bldg.,	Newark, N. J.	Sept. 12
Sept. 17.	Fire dep't building,	Jersey City, N.J.	Sept. 12
Sept. 17.	Light house bldg.,	Cape San Blas, Fla.	Sept. 12
Sept. 17.	Sewer connections,	Indianapolis, Ind.	Sept. 12
Sept. 17.	Brick sewers,	Indianapolis, Ind.	Sept. 12
Sept. 17.	Pipe sewers,	Newark, N. J.	Sept. 12
Sept. 17.	Pipe sewers,	Jersey City, N. J.	Sept. 12
Sept. 17.	Main sewers,	Philadelphia, Pa.	Sept. 12
Sept. 17.	Sewer inlets,	Philadelphia, Pa.	Sept. 12
Sept. 17.	Sewer blocks (22,000),	Baltimore, Md.	Sept. 12
Sept. 17.	Macadamizing, Griswold,	Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 17.	Paving, Hamden,	Conn.	Sept. 12
Sept. 17.	Macadamizing, Griswold,	Conn.	Sept. 12
Sept. 17.	Paving, Dayton,	O.	Sept. 12
Sept. 17.	Macadamizing, St. Louis,	Mo.	Sept. 12
Sept. 17.	Bridges, Philadelphia,	Pa.	Sept. 12
Sept. 18.	Water-wks. franchise, Butte,	Mont.	July 11
	Advertised, Eng. News, July 11 to Aug. 22.		
Sept. 18.	State capitol work,	Denver, Colo.	Aug. 29
Sept. 18.	Addition to museum bldg.,	New York.	Sept. 5
Sept. 18.	Road in Putnam county,	N. Y.	Sept. 5
Sept. 18.	Ventilating & heating,	Providence, R.I.	Sept. 12
Sept. 18.	Asphalt paving,	Denver, Colo.	Sept. 12
Sept. 18.	Sale of dredge,	New York, N. Y.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 18.	Macadamizing,	Essex, Conn.	Sept. 12
Sept. 18.	Paving, North Branford,	Conn.	Sept. 12
Sept. 18.	Pipe sewers,	West Hoboken, N. J.	Sept. 12
Sept. 18.	Asphalt paving,	New York, N. Y.	Sept. 12
Sept. 18.	Macadamizing,	New York, N. Y.	Sept. 12
Sept. 19.	Sale of dredge, etc.,	Newport, R. I.	Aug. 22
	Advertised, Eng. News, Aug. 22 to Sept. 12.		
Sept. 19.	Iron bridge,	Greensburg, Pa.	Aug. 29
Sept. 19.	Rebuilding pump'g mach.,	Cleveland.	Sept. 5
Sept. 19.	Subway,	Boston, Mass.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 19.	Paving, North Haven,	Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 19.	Paving, Seymour,	Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 19.	Steel bridges (2),	Providence, R. I.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 19.	Iron bridge,	Bridgeton, N. J.	Sept. 12
Sept. 20.	Steel supports, etc.,	Chicago, Ill.	Aug. 22
Sept. 20.	Passenger elevator,	Paris, Tex.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 20.	Pipe sewers,	Greenfield, Ind.	Sept. 5
Sept. 20.	Bridge, Niagara Falls,	N. Y.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 20.	Paving,	Rochester, N. Y.	Sept. 12
Sept. 20.	Cement sidewalks,	Dayton, O.	Sept. 12
Sept. 20.	Railway (35 miles),	Lima, O.	Sept. 12
	Advertised, Eng. News, Sept. 12 and 19.		
Sept. 20.	Pipe sewers,	Troy, N. Y.	Sept. 12
Sept. 20.	Macadam road,	Voluntown, Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12 and 19.		
Sept. 21.	Water-wks. plans,	Tippecanoe City, O.	Sept. 12
	Advertised, Eng. News, Sept. 12 and 19.		
Sept. 21.	Cement sidewalks,	Indianapolis, Ind.	Sept. 12
Sept. 21.	Macadam road,	East Windsor, Conn.	Sept. 12
Sept. 21.	Water bonds,	St. Charles, Minn.	Sept. 12
Sept. 21.	Pipe sewers (2,500 ft.),	Indianapolis, Ind.	Sept. 19
Sept. 21.	Bridge abutm'ts,	Council Grove, Kan.	Sept. 12
Sept. 23.	Lighting court house,	Decatur, Tex.	Aug. 29
Sept. 23.	Bridge,	Wabash, Ind.	Aug. 29
Sept. 23.	Pier work, etc.,	in Delaware River.	Sept. 12
Sept. 23.	Sidewalks,	South Bend, Ind.	Sept. 12
Sept. 24.	Electric r'y franchise,	Los Angeles, Cal.	Aug. 29
Sept. 24.	Library bldg. work,	Washington.	Sept. 12
Sept. 24.	Steel bridge,	Worthington, Minn.	Sept. 12
Sept. 25.	Sidewalks,	Elkhart, Ind.	Sept. 12
Sept. 25.	Improving street,	Hoboken, N. J.	Sept. 12
Sept. 25.	Macadam road,	Preston, Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 25.	Pipe sewers (12,000 ft.),	Woodstock, N.B.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 26.	Water-wks. system,	W. Carthage, N.Y.	Sept. 12
Sept. 26.	Macadam road,	Pomfret, Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 26.	Road,	Ansonia, Conn.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 26.	Reservoir,	Bristol, Va.	Sept. 12
Sept. 26.	Bank building,	Grafton, W. Va.	Sept. 12
Sept. 26.	Laying water pipe,	Elmwood, Ill.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 27.	Brick sewers (14,450 ft.),	Kingston, N.Y.	Aug. 29
Sept. 27.	Barges,	Louisville, Ky.	Sept. 5
Sept. 27.	Museum building,	Milwaukee, Wis.	Sept. 12
Sept. 27.	Public building,	Allegheny, Pa.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 27.	Water-wks. system,	Cold Spring, N. Y.	Sept. 12
	Advertised, Eng. News, Sept. 12 and 19.		
Sept. 28.	Water-wks. system,	Ephrata, Pa.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 28.	Cement,	Washington, D. C.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Sept. 30.	Water-works system,	Bond Hill, O.	Sept. 5
	Advertised, Eng. News, Sept. 5 and 12.		
Sept. 30.	School building,	Mark Center, O.	Sept. 12
Sept. 30.	Iron bridges (2),	Pottsville, Pa.	Sept. 12
Oct. 1.	Plans for art building,	Philadelphia, Pa.	May 23
	Advertised, Eng. News, May 23 to June 27.		
Oct. 1.	**Composite gunboats,**	**Washington, D. C.**	**Aug. 1**
Oct. 1.	Water-wks. system,	Mt. Sterling, O.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Oct. 1.	Dredging canal,	Port Huron, Mich.	Sept. 12
	Advertised, Eng. News, Sept. 12 and 19.		
Oct. 1.	State capitol work,	Denver, Colo.	Sept. 12
Oct. 1.	Court house,	Knoxville, Ia.	Sept. 12
Oct. 1.	Electric light plant,	Mt. Sterling, O.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Oct. 2.	Court house,	Columbus, Ga.	Sept. 5
Oct. 5.	School building,	Norwood, O.	Sept. 12
Oct. 9.	Sale of canal,	Annapolis, Md.	Aug. 22
Oct. 9.	Water-works crib,	Cleveland, O.	Sept. 12
Oct. 9.	Traveling cranes (2),	Cleveland, O.	Sept. 12
Oct. 9.	Mechanical stockers,	Cleveland, O.	Sept. 12
Oct. 16.	Plans for city hall,	Somerville, Mass.	Aug. 29
Oct. 21.	Pumping engine,	Washington, D. C.	Sept. 12
	Advertised, Eng. News, Sept. 12.		
Oct. 26.	Bronze tablet,	Gettysburg Military P'k.	Sept. 12
	Advertised, Eng. News, Oct. 3.		
Nov. 1.	**Plans school building,**	**Pittsburg, Pa.**	**Aug. 8**
Nov. 19.	State capitol,	Olympia, Wash.	Sept. 12
	Advertised, Eng. News, Sept. 12 to Oct. 31.		
Nov. 20.	Sewer system (22 miles),	Mobile, Ala.	Aug. 29
	Advertised, Eng. News, Aug. 29 to Oct. 24.		
No date.	Government buildings,	Gallup, N. Mex.	Sept. 12
"	Electric light plant,	Egypt, N. C.	Sept. 12

RAILWAYS.

East of Chicago.

CAMMAL & BLACK FOREST.—Press reports state that this railway will be extended about 12 miles in the spring. Gen. Man., J. S. Childs, Jersey Shore, Pa.

CHICAGO, INDIANAPOLIS & CHATTANOOGA SOUTHERN.—Reports from Rockport, Ind., state that Capt. John G. Elgenman, a contractor and prominent citizen of Spencer county, and associates, have secured control of this company, and that the commissioners of Spencer county have granted an extension of time in which to build the road in that county. The route now considered is from Newburg, via Rockport, Grandview, St. Meinard, crossing the Air Line at St. Anthony, and thence to Mitchell. The work of grading, etc., will be done exclusively by citizens residing along the route.

DEER PARK & PITTSBURG CONNECTING.—Bids are about to be asked, according to reports, for building about 10 miles of this railway. The project was noted last week. Address J. D. Hamill, Oakland, Md.

HUDSON RIVER & WASHINGTON COUNTY MIDLAND.—Incorporated in New York, Sept. 6, to build and operate a steam railway seven miles long from Schuylersville, Saratoga county, to Greenwich, Washington county; capital stock, $125,000; directors, Chas. K. Phelps, James Cameron, Wm. M. Kennedy, of New York; Sanford Stewart, Norman F. Stewart, Jas. J. Wells, Watson N. Sprague, of Greenwich; Wm. H. McCall, of Saratoga Springs; and Wm. Orr, of North Adams, Mass; principal office at Greenwich, N. Y.

INDIANA CENTRAL.—Incorporated in Indiana to build a railway from Union City, Randolph county, to Huntington. Huntington county, 60 miles; capital stock, $100,000; incorporators, W. M. Page, Oscar E. Evans, J. Z. Armstrong, Jos. H. Shoemaker, Henry C. Zeigler, W. C. Howe and Eugene G. Palmer. This is probably a reorganization of the Chicago, Union City & Cincinnati project, which has been in financial difficulties for some time.

LIMA NORTHERN.—Bids are asked until Sept. 20 for constructing 35 miles of this railway, as stated in our advertising columns. The awarding of the contract for building this entire line, 70 miles in length, to W. B. Strang & Co., 15 Wall St., New York, was noted last week.

WASHINGTON COUNTY.—The directors of this company have voted to contract with Geo. P. Wescott and Jas. Mitchell, of Portland, Me., for the construction of this road, actual work to be commenced this month.

Southern.

ALBEMARLE & RALEIGH.—The Southern Ry. Co. has been urged to complete this road from Springhope, N. C., its present terminus, to Raleigh, and the officials of that system have the matter under advisement.

ATLANTIC & NORTH CAROLINA.—The directors of this road have decided not to pay the usual annual dividend this month, but to apply the net earnings of the road to improving the bridges and rolling stock.

COLUMBIA, NEWBERRY & LAURENS.—Press reports state that this railway will be extended to Laurens, S. C., at an early date. Pres., W. G. Childs, Columbia, S. C.

DAHLONEGA.—Incorporated in Georgia to build a railway from Dahlonega to Lula or Gainesville; capital stock, $300,000; incorporators, Geo. W. Scott, C. M. Candler and N. P. Pratt, of Atlanta; W. A. Charters, W. P. Price, W. G. Boyd and F. W. Hall, of Dahlonega; A. G. Jennings, of New York, and George J. Baldwin, of Savannah. Pres., Geo. W. Scott; Vice-Pres., W. P. Price; Treas., N. P. Pratt; Secy., J. F. Moore. It is stated that the entire capital stock has been subscribed. The road will be built by the Dahlonega Construction Co., of which Geo. J. Baldwin is president. Maj. C. M. Bolton, formerly Ch. Engr. Southern Ry., is in charge of the surveys.

GULF & SHIP ISLAND.—T. J. Stewart, Receiver, has been authorized by the court to enter into a contract with responsible parties to restore the 20 miles of road from Gulfport, Miss., north and to complete the road from Hattiesburg south to the gulf. S. S. Bullis, of Olean, N. Y., has contracted to build the road, and is to begin work by Sept. 15, and have the road completed

from Gulfport to Hattiesburg, 70 miles, by Sept. 15, 1896. The road was graded to Hattiesburg several years ago, and 20 miles of track were laid from Gulfport north.

Northwest.

BIG FALLS.—Incorporated in Wisconsin to build a railway from Big Falls, in Waupaca county to a junction with the Chicago & Northwestern in Shawand county; capital stock, $1,000; incorporators, Thos. Wall, J. H. Wall, James Spalding and H. B. Harshaw, of Oshkosh, Wis., and Thos. R. Wall, of Clintonville, Wis.

KEWAUNEE, LAKE SUPERIOR & SOUTHERN.—Incorporated in Wisconsin to build a railway from Superior to Prentice, and from Superior to Trenins, Wis., on the Chicago, Milwaukee & St. Paul, a total length of about 380 miles. Capital stock, $4,200,000. The incorporators are principally Eastern capitalists, Robert Lenox Belknap, of New York, former Treasurer of the Northern Pacific, being at the head of the enterprise.

LOGGING ROAD.—A press report from Tower, Minn., states that William Allen, of Ashland; Louis Lafonas, of Republic; J. O. Callahan and D. Witteuberg, Jr., of Sagola, Mich., comprise a party of capitalists who are at Tower figuring on contracting with the Home Lumber Co. to put in a logging railway to 61-14, 12 miles in length, and cut the company's timber this winter.

MANISTIQUE & NORTHWESTERN.—The contract for building this railway has been awarded to Parker & Anderson, of Rhinelander, Wis. The road will be built from Manistique, Mich., 21 miles northwest, and will ultimately be extended to Nagaunee. The Chicago Lumber Co. is said to be the owner of the road. Between 400 and 500 men will be put at work at once on the line, according to the reports.

NORTH PLATTE & GERING.—A press report from North Platte, Neb., states that a local company has been organized to build a railway to Gering. The idea is to grade and tie the road and get permission of the federal court to allow the Union Pacific receivers to iron and operate it. The estimated cost of grading and putting down the ties is about $900 per mile for the 160 miles. Judge Neville, Lester Ellis, T. C. Patterson, Charles Iddings, W. W. Birge, M. C. Keith and John Bratt, of North Platte, and A. P. Gering, of Gering, have been appointed a committee on organization and to get all possible information and assurances possible from the Union Pacific receivers.

Southwest.

ALVIN, BRAZORIA & WESTERN.—This company is reported to have been organized to build the proposed railway from Alvin, Tex., via Angleton to Brazoria and westward. J. C. McBride, of Alvin, is one of the projectors.

ARKANSAS & CHOCTAW.—Incorporated in Arkansas, Aug. 31, to build a railway from Ashdown Station, on the Kansas City, Pittsburg & Gulf, into Indian Territory, 70 miles; capital stock, $1,500,000; incorporators, J. E. Williams and J. H. Bilheimer, of Little Rock, and R. H. Keith, of Kansas City. The Cincinnati Coal & Coke Co. will operate the line. Surveys are now in progress, and it is hoped to begin the construction next month.

DALLAS TERMINAL.—The construction of this terminal railway at Dallas, Tex., was commenced Aug. 29. Pres., W. C. Connor.

TECUMSEH & GUTHRIE.—Incorporated in Oklahoma, Sept. 3, to build a railway from Guthrie to Tecumseh, and thence southeast through the Chickasaw coalfields and into Texas; capital stock, $1,000,000; directors, J. B. Otto, Henry Loop, E. R. Mundy, T. M. Phanp, G. P. Leighton, J. B. Gaylord, E. C. Nichols, A. T. Foster, S. S. Rains, D. W. Cronin, S. J. Scott, T. J. Huckaba and S. Clay.

Rocky Mt. and Pacific.

CALIFORNIA, PHOENIX & EASTERN.—This projected railway was noted in our issue of Aug. 22. The "Railroad Gazette" states that the contract for grading the first 10 miles of the line out of Phoenix, Ariz., will probably be let during the present month. The road is projected by the Fowler Co., of Phoenix, which is largely interested in the Phoenix mining district. The right of way has been secured for 19 miles and ground for terminals in that town has also been purchased. At the end of the present right of way the company will connect with the projected line of the Aqua Fira & Hassayampa road, which owns the right of way to and through Sydney and thence west through the Gila Valley. L. Fowler is president of both companies, and Henry S. Fowler is secretary.

FLAGSTAFF & CANYON.—W. W. Follett, Ch. Engr., has just completed preliminary surveys of two routes for a railway from the Atlantic & Pacific road to the Grand Canyon, a distance of about 78 miles; work light; 2% maximum gradient; 12° probable maximum curve. Estimates are now being prepared, and it is expected to begin grading on the first 20 miles this fall. The traffic will be principally lumber and ore, with a good amount of tourist travel. Pres., Jas. A. Fleming; Vice-Pres., P. W. Fleming; Secy., D. A. Abrams; Treas., Richard Fleming, all of Flagstaff, Ariz.

STREET AND ELECTRIC RAILWAYS.

BURLINGTON, VT.—The Military Post St. Ry. Co., which recently built an electric railway from Winooski to Essex Junction, by way of Fort Ethan Allen, has petitioned for a franchise to extend its road on several streets in this city, and through the city to Queen City Park and also to Rock Point. Several of the streets are already occupied by the Winooski & Burlington Horse R. R. Co.'s electric line. Address F. C. Kennedy.

ANDOVER, MASS.—It is stated that a street railway company, composed of residents of Andover and Ballardvale, is being organized with a capital stock of $30,000, to construct a railway between Andover, Ballardvale, North Andover, and North Reading. The directors are: Wm. H. Jowell, Joseph M. Bradley, H. Bradford Lewis, Walter H. Coleman, John M. Cole, William Odling and Howell F. Wilson.

BRAINTREE, MASS.—The New York, New Haven & Hartford R. R. Co. is making arrangements for the extension of its electricrl system. It is stated that the company will at once equip that portion of its road running between Cohasset and Braintree, a distance of about 15 miles, in connection with the Nantasket Beach branch. Engineers are now making the necessary surveys.

HANSON, MASS.—The Hanson Electric R. R. Co. has been organized and will at once petition the selectmen for a franchise. Pres., Frank Bourne; Vice-Pres., W. G. Elms; Secy., F. S. Thomas; Treas., Henry L. Powers.

SOUTHBRIDGE, MASS.—The stock for the proposed Southbridge & Fiskdale Electric R. R. has all been subscribed. F. L. Chapin and G. W. Wells, of this place, and Thos. T. Robinson, of Deadham, are interested.

NEW HAVEN, CONN.—The Winchester Ave. R. R. Co. proposes to extend its electric road on a number of streets. Gen. Man., Israel A. Kelsey.

AUBURN, N. Y.—The Auburn Inter-Urban Electric R. R. Co. has been granted a franchise for its proposed road in this city, and to Skaneateles, from Syracuse. This company was lately incorporated with a capital stock of $250,000, by E. F. Voris, G. C. Kohler and L. S. Ebright, of Akron, O.; John J. Smith, of Cincinnati, O.; Chas. P. Mosher, and H. V. S. Lord, of Auburn, N. Y.

BROOKLYN, N. Y.—The trustees of the Brooklyn Bridge have passed a resolution authorizing C. C. Martin, Ch. Engr., to secure estimates, etc., for the proposed equipping of the trains with electricity.

BROOKLYN, N. Y.—Local papers state that the Nassau Electric R. R. Co., of Brooklyn, will apply to the general term of the supreme court, in Newburg, for the appointment of commissioners to hold public hearings and decide as to the necessity for a trolley road in Union St. The company wants to construct its railway in that street as soon as possible. Its route will be from Hamilton Ferry, through Union St., to the Prospect Park Plaza, through Douglass St. to East New York Ave. to Liberty Ave. to the city line. The commission, if convinced that such a railway route would be a public benefit, will condemn the property along Union St. The value of the property directly condemned is about $4,000,000.

KINGSTON, N. Y.—The Ulster County Electric R. R. Co. has been incorporated to construct an electric road, about seven miles in length, in Kingston; capital stock, $100,000; directors, Charles A. Johnson, Frederic H. Reed, George N. McKibbin, William C. Orton, Robert McA. Lloyd, Charles M. Nichols, Raymond C. Johnson and Harry C. Evans, of New York, and William T. Tiers, of Philadelphia, Pa.

NEW ROCHELLE, N. Y.—The Southern New York Ry. Co., has been incorporated to operate a street railway for a distance of one mile in this village; capital stock, $10,000; directors, Alanson T. Enos, of Englewood, N. J.; Joseph S. Tracy, of Larchmont; Chas. F. Tracy, of Fordham; Edward F. Theyson, A. Phillip Stanford, Franklin Paddock and Robert B. Wade, of New York; George P. Morgan, of New Rochelle, and Henry F. Gove, of Brooklyn.

SCHUYLERSVILLE, N. Y.—The J. A. Vail Construction Co., of New York, has been awarded the contract for building an electric road between this place and Greenwich.

LONG BRANCH, N. J.—Application has been made to the Long Branch Commissioners, by the Atlantic Coast Electric Ry. Co., for the location of its tracks within the corporate limits of Long Branch. Pres., R. Blodgett; Clk., R. Jerome Van Blunt.

CAMBRIDGEBORO, PA.—The Cambridge Springs Co. is considering the question of building a street railway. It is stated that surveys are being made for a road from Meadville to Erie, by way of this town, a distance of about 40 miles.

PHILADELPHIA, PA.—The Union Traction Co. has been incorporated with a capital stock of $100,000; incorporators, James McManes, Peter A. B. Widener, William L. Elkins, Thomas Dolan, George D. Widener, Jeremiah J. Sullivan, Alfred Smith, Alexander M. Fox, John Lowber Welsh, William H. Shelmerdine, Caleb F. Fox. Treas., Charles O. Kruger.

PITTSBURG, PA.—The Knoxville, Fairhaven & Mount Lebanon Ry. Co. is to build a double-track electric railway from Knoxville to Castle Shannon, a distance of five miles, at an estimated cost of $150,000. The road will be operated by the Pittsburg & Birmingham Traction Co.; Electrical Supt., W. B. Rommel. The Knoxville, Fairhaven & Mount Lebanon Ry. Co. was recently incorporated with a capital stock of $100,000, by J. F. Grimes, Pres. Knoxville Land & Improvement Co.; W. W. Murray and others. S. A. Tomes, engineer in charge of work.

BALTIMORE, MD.—A survey of the entire route of the Washington, Sandy Springs & Baltimore Electric Ry. has been completed. Gen. Man., Dr. Frank C. Drane.

RIVERDALE, MD.—It is stated that the final survey for the new electric railway between Washington and Laurel has been made through this village. The line will run west of the Baltimore & Ohio R. R., as near the track as the right of way of that railway will allow. The contract for grading the road of the electric railway for this section will be awarded soon.

ALEXANDRIA, VA.—It is stated that a loan of $750,000 has been secured by the Washington, Alexandria & Mount Vernon Electric Ry. Co. from the Real Estate Trust Co., of Philadelphia, $550,000 of which will be used in constructing the road. Pres., G. R. Abbott. James S. Swartz and Frank K. Hipple, of Philadelphia, Pa., are interested.

MERIDIAN, MISS.—It is stated that F. B. Merrill, representing a New York syndicate, has received a franchise for an electric railway.

GALLIPOLIS, O.—The Gallipolis & Point Pleasant Ry. Co. has been incorporated to build an electric railway. Capital stock, $50,000. Incorporators, John L. Vance, H. C. Johnson, L. E. Jones, Lawrence H. Cott and C. R. Duffey.

TOLEDO, O.—A. Bently, of Toledo, has been awarded the contract for constructing a new power house for the Toledo Traction Co., at about $50,000.

ZANESVILLE, O.—The council is about to be petitioned by the Zanesville St. Ry. Co., recently organized, for a franchise.

ANDERSON, IND.—The contract of the New York Construction Co., 95 and 97 Nassau St., New York, for the construction of the Indianapolis, Anderson & Marion Ry., between Anderson and Marion, Ind., has been sold and assigned to L. E. Miller, of New York, who is expected to complete the construction of this electric road.

FORT WAYNE, IND.—The Fort Wayne & Hicksville Electric Ry. Co. has been incorporated with a capital stock of $50,000; directors, John S. Hart, James B. Colegrove, John W. Winn, A. M. Richelderfer, Clarence F. Swift, Charles M. McCullough and Perry A. Randall.

INDIANAPOLIS, IND.—Press reports state that the Broad Ripple Transit Co., which operates an electric line from the corporate limits to Broad Ripple, nine miles distant, has applied for a right of way to the center of the city, offering to carry passengers its entire length for 5 cts. It has also offered $500,000 for a right on all the streets, as a successor to the old company, the charter of which expires in 1901.

ALLEGAN, MICH.—It is stated that F. A. Makin is interested in a projected electric railway from this place to Saugatuck.

DETROIT, MICH.—Contracts were awarded Sept. 2 for the construction of an electric railway to Birmingham, a distance of 12 miles. It is probable that next year the line will be extended to Pontiac, a distance of seven miles from Birmingham. Another route for this proposed extension is by way of Orchard and Sylvan, a distance of 11 miles. It is also proposed to build a line to Farmington, by way of Ravenswood, Greenfield, Sand Hill and Clarenceville, a distance of 15½ miles, with a branch from Clarenceville to Northville, a distance of nine miles. Seymour Brownell, 20 West High St., Detroit; Wm. A. Jackson, Frank E. Snow and others representing eastern capitalists are interested.

WAUKEGAN, ILL.—C. E. Loss, of Chicago, is reported as having been granted a franchise for an electric railway.

NEVADA, MO.—The Nevada Electric Ry., Light & Power Co. has ben organized with a capital stock of $130,000, and will apply for a charter next week. The company will be composed of George Dudley, Judge Mills, Selden Spencer, F. T. Allison and Dr. T. F. Prewitt, all of St. Louis; C. F. Strohm and Col. Harry Moore, of Nevada.

DENVER, COLO.—The Denver, Globeville & Golden Rapid Transit Co. has been incorporated to construct an electric road; capital stock, $100,000; incorporators, Lewis E. Lemen, George S. Parsons, Irving F. Root, Denver; R. C. Lingo, North Denver, and S. R. Wright, Highland, Colo.

PUEBLO, COLO.—The Pueblo Electric St. Ry. Co. has been incorporated with a capital stock of $500,000. Incorporators, A. D. Pattison, Elmer E. Whitted, Anthony C. Campbell, Irving Hall and Frank B. Gibson.

ELECTRIC LIGHT AND POWER.

NORTHAMPTON, MASS.—The electric light company is about to make a number of improvements to its plant. Supt., L. J. Hutchinson.

SPRINGFIELD, MASS.—It is stated that there is a movement in West Springfield to have the town establish an electric light plant, and those interested in the project have succeeded in having an article introduced in the warrant for the next town meeting calling for a vote on the question.

BLOOMFIELD, N. J.—J. W. Schroeder, of New York, has petitioned the Bloomfield township committee for an electric light franchise.

EGYPT, N. C.—Bids are asked for constructing an electric light plant of about 1,500 incandescent and 150 arc lights capacity. Address Henszey-Langston Coal Co.

ANDERSON, S. C.—The Anderson Electric Light & Power Co. is considering the question of utilizing the water of Portman Shoals, on the Seneca River, nine miles from this place, for power purposes, estimated to cost $80,000.

DUBLIN, GA.—It is stated that this city is discussing the question of constructing an electric light and water works plant. James B. Sanders, Mayor.

HUBBARD, O.—Hubbard will hold an election Sept. 14 to vote on the question of issuing $6,000 in electric light bonds.

MOUNT STERLING, O.—Bids are asked until Oct. 1 for furnishing materials and constructing an electric light plant, including 80-HP. engine, boilers, etc., as stated in our advertising columns. Engrs., E. P. Roberts & Co., Cleveland; John W. Hanawalt, Clk.

SHELBY, O.—The council has decided to rebuild the electric light plant and to purchase a new dynamo and boiler, and otherwise increase the power of the plant.

BAY CITY, MICH.—The electric light company has appointed a committee to advertise for bids for supplying the Bay City electric light plant with new dynamos and other apparatus.

ST. LOUIS, MO.—Bids were received Sept. 10 by H. E. Roach & Son, 717 Chestnut St., for furnishing elevators, dynamos, water-tube boilers, steam-heating plant and electric wiring for the eight-story commercial building now being erected by John E. Liggett, Eighth and Washington Sts.

SPRINGFIELD, MO.—Plans and specifications are being prepared for a steel electric light tower 80 ft. in height in the square, estimated to cost $1,000. W. H. Gottfried, Chn. Com.

BEEVILLE, TEX.—W. H. Wolfe, of Lowry & Wolfe, of Temple, has submitted a proposition to the council for the construction of an electric light and telephone plant.

CONWAY, ARK.—G. H. Burr has organized an electric light company, according to reports.

NEW COMPANIES.—L. A. Chase & Co., Portland, Me.; $50,000; to deal in electrical appliances; Pres., Josiah H. Drummund, Portland.

Nevada Electric Ry., Light & Power Co., Nevada, Mo.; $130,000; George Dudley, Selden Spencer, of St. Louis; C. F. Strohm, Nevada.

Citizens' Telephone & Electric Co., Hoboken, N. J.; $50,000; Wm. H. Elles, John Ryan, John J. Cuddiley, Hoboken, N. J.; Moris Frankford, New York, N. Y.

Winchester Gas & Electric Light Co., Winchester, Mass.; $50,000; Pres., Lewis C. Pattee; Treas., David N. Skillings, Hales W. Suter, N. T. Apollonio, F. J. O'Hara.

Gates Electric Mfg. Co., Chicago, Ill.; $25,000; to manufacture and operate electric light plants; J. Holt Gates, William F. Cramp, Jr., Adolph Lissan, D. V. Samuels.

Island Pond Electric Light & Power Co., Island Pond, Vt.; $10,000; George H. Fitzgerald, Z. M. Mansur, H. E. Fitzgerald, L. A. Cobb, E. W. Bartlett, of Island Pond, Vt.

The Electric Illuminating & Power Co., of Long Island City, N. Y.; capital stock increased from $50,000 to $150,000; Robert C. Pruyn, of Albany; Edward A. Maher, Thos. W. Olcott.

Manhattan General Construction Co., New York,

N. Y.; $100,000; to manufacture electrical apparatus; Charles D. Hill, Benjamin A. Gould, Jr., 43 Cedar St., and others, of New York.

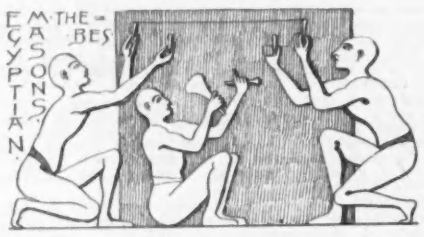
Weatherford Water, Light & Ice Co., Weatherford, Tex.; $80,000; M. H. Arnst, Platt V. Bryan, Elmira, N. Y.; G. A. Holland, W. P. Anderson, Weatherford, Tex.; W. T. Hudgins, Texarkana, Tex.

Falls Electric Power Land Co., Niagara Falls, N. Y.; $150,000; J. C. Morgan, Richard F. Rankine, Niagara Falls; Commodore P. Vedder, Ellicottville; Jerome B. Fisher, Jamestown; G. H. Johnson, Niagara Falls, Ont.

Acetylene Light, Heat & Power Co., Philadelphia, Pa.; $1,000,000; to make and sell the products of calcium carbide; C. C. Adams, E. C. Nephey, Sam'l L. Kent, Frederick Rumpf, T. Morris Perot, W. W. Ingram, E. H. Meyer.

Phoenix National Telephone Co., Des Moines, Ia.; $1,000,000; to construct electric plants, electric railways, etc.; Charles M. Waterbury, John W. Paris, Noah J. Clodfelter, Chas. A. Meeker, Addison; Curtis D. Meeker, Jacob Frankel, Geo. W. Hadley and J. M. Smith.

BRIDGES.



PROVIDENCE, R. I.—Bids are asked until Sept. 19 for constructing two steel highway bridges, as stated in our advertising columns. Robt. E. Smith, Comr. Pub. Wks.

BRIDGETON, N. J.—Bids are asked until Sept. 19 for constructing an iron bridge over the Cohansey River at Broad St. J. T. White, Albert Harris, Wm. Leach, Committee.

LOCKPORT, N. Y.—The board of canal commissioners has approved plans prepared by the Lock City Electric R. R. Co. for a bridge over the canal in East Lockport.

NEW YORK, N. Y.—F. W. Miller has been awarded the contract at $140 for making preliminary borings for the new East River bridge. The borings will be made at South Fifth and South Third Sts., Brooklyn, and at Delancey St., and the next pier north, on the New York side. The commission has appointed Edwin Duryea, Jr., assistant engineer to superintend at keeping the records of the borings, and Francis L. Pruyn assistant engineer on the plans. Ch. Engr., Leffert L. Buck.——It is proposed to construct a viaduct at Riverside Park, to extend from 95th to 97th Sts., a distance of about 500 ft., plans for which have been adopted by the park board. Howard & Caldwell, 31 Pine St., have prepared a sketch for the proposed viaduct, which will be the foundation for future plans. Expense of the viaduct will be covered by the appropriation of $200,000, allowed Riverside Park for 1896.

NIAGARA FALLS, N. Y.—At an election held recently it was voted to issue $9,000 in bonds for a new bridge over the hydraulic canal at Second St. W. W. Read, Cy. Engr.; S. F. Arkush, Cy. Clk.

NIAGARA FALLS, N. Y.—Bids are asked until Sept. 20 for constructing a 150-ft. span bridge, with masonry abutments, as stated in our advertising columns. W. W. Read, Cy. Engr.

SYRACUSE, N. Y.—Bids are asked until Sept. 16 for constructing a stone arch bridge over the Harbor Brook at Park Ave. H. C. Allen, Cy. Engr.

PATERSON, N. J.—Bids are asked until Sept. 16 for constructing a footbridge over the canal at West 27th St. J. H. Burke, Chn. Com. on Paterson Canal Bridges.

MIDDLETOWN, PA.—It is reported that the plans for the county bridge at Manada Hill, the abutments of which have recently been completed by Jacob Hocker, have been prepared by Geo. S. Mish, borough surveyor, of Middletown.

MONONGAHELA CITY, PA.—Plans prepared for a bridge for the Pittsburg, Monongahela & Wheeling R. R. Co., at this city, have been approved by the river and harbor committee.

PHILADELPHIA, PA.—Bids are asked until Sept. 17 for constructing certain bridges. Thos. M. Thompson, Dir. Dept. Pub. Wks.

POTTSVILLE, PA.—Bids are asked until Sept. 30 for constructing an iron bridge in Pinegrove township, and one in Ashland borough. Chas. F. Allen, County Comr.; P. J. Connell, Clk.

ROCHESTER, PA.—Press reports state as follows: At a meeting of the new Ohio River Bridge Co., organized to construct a suspension bridge across the Ohio River at this point, a committee of prominent citizens was appointed to solicit subscriptions to the capital stock. Over $60,000 of stock has already been taken of the $150,000, the total cost of the structure. When $75,000 is subscribed the Penn Bridge Co. will build the bridge, and take a mortgage for the remaining $75,000, until the receipts from toll shall clear the bridge company of its indebtedness.

SCRANTON, PA.—The following bids were received Sept. 5 for constructing approaches to the Linden St. bridge; estimated to cost $21,930; Joseph P. Phillips, Cy. Engr.:

Dunn Bros., Scranton and Wilkes Barre, Pa..	$19,433
V. H. O'Hara, Scranton, Pa.	19,089
Pete Stipp, Scranton, Pa.	20,600
John T. Fitzpatrick, Scranton, Pa.	20,500
King & Cleary, Shenandoah, Pa.	18,045

The work consists of curbing, flagging, stone block pavement, hand rail, catchbasins, dry masonry, excavation and filling, the estimates for which were noted in our issue of Aug. 29.

DETROIT, MICH.—The contract for building a 50-ft. span Melan arch bridge below the Michigan Central Ry. tracks, on the Southern Boulevard, has been awarded by the park commissioners to T. J. Kennedy, of Detroit, at $34,122, exclusive of excavation.

ECORSE, MICH.—It is reported that an election will be held Sept. 17 to vote on the question of constructing an iron bridge over the River Rouge. The structure is estimated to cost, $22,000, as noted in our issue of last week.

GREEN BAY, WIS.—A resolution, introduced in the council by Alderman Sellers, for building a bridge across the Slough, connecting the 7th and 8th wards, at Broadway, has been adopted, and plans will be prepared for the new structure at once.

DULUTH, MINN.—Plans and specifications have been prepared for a steel viaduct at Garfield Ave., to span the yards and tracks of the St. Paul & Duluth and Northern Pacific railways. The structure will be 1,860 ft. long and will consist of 59 spans and is estimated to cost between $150,000 and $160,000.

MINNEAPOLIS, MINN.—An ordinance has been introduced in the council appropriating $15,500 for a bridge over the Union tracks at 14th Ave., S. E., according to reports.

WORTHINGTON, MINN.—Bids are asked until Sept. 24 for the construction of a 40-ft. steel bridge, with an 18-ft. roadway. John J. Kendle, County Audr.

COUNCIL GROVE, KAN.—Bids are asked by the board of Elm Creek township until Sept. 21 for building two stone abutments on Four Mile Creek, at the Maple Grove crossing. F. H. Hannah, Clk.

KANSAS CITY, KAN.—Bids are asked until Sept. 16 for rebuilding bridge No. 2 on the Bottom road in Quindaro township, according to reports. Chas. E. Bruce, County Clk.

ST. LOUIS, MO.—The St. Louis Manufacturers' Association is securing subscribers for the construction of a free bridge over the Mississippi River, to cost about $10,000,000, either at Choteau or Cass Ave. The association was organized last April, and now has 167 St. Louis manufacturing companies as members. Pres., L. D. Kingsland; Vice-Pres., E. O. Stannard; Treas., Geo. W. Brown; Secy., Thos. L. Cannon.

DALLAS, TEX.—The county commissioners have rejected the bids for constructing a bridge, as they were considered too high, and have decided to readvertise the work.

SPRAGUE, WASH.—The council has directed the clerk to advertise for bids for constructing bridges at First, B, and Porak Sts. It is estimated that 21,846 ft. of lumber will be needed. T. M. Cooper, Cy. Surv.

HARTLAND, N. B.—J. T. O. Dibblee, Member of Parliament, and Mr. Wetmore, Government Engr., have been in Hartland to examine a site for a bridge across the river at this place.

BUILDINGS.

BOSTON, MASS.—The wharf and freight sheds owned by the Boston & Albany R. R. Co. in East Boston were destroyed by fire Sept. 4 causing a loss of $200,000, or a total loss of $500,000, including the merchandise destroyed. The buildings were 342 × 220 ft.

PROVIDENCE, R. I.—The New York, New Haven & Hartford R. R. Co. is preparing plans for extending its freight house and the contract for the ironwork will be awarded as soon as the specifications are complete.

PROVIDENCE, R. I.—Bids are asked until Sept. 18 for putting a heating and ventilating apparatus in the state normal school building at Park, Gaspee and Francis Sts. T. B. Stockwell, Secy. Com.; Archs., Martin & Hall, 50 Industrial Trust Co.'s Bldg., Providence; Engr., Prof. S. H. Woodbridge, 85 Water St., Boston.

NEW HAVEN, CONN.—Bids are asked until Sept. 14 for constructing an addition to the county jail. Address Wm. H. Allen, Arch., New Haven; Albert B. Dunham, County Comr.

BINGHAMTON, N. Y.—Bids are asked until Sept. 16 for constructing additions to the north building of Binghamton state hospital; bond, $10,000. (Postponement from Sept. 9.) Arch., I. G. Perry, Binghamton and Albany; John Anderson, Secy. Bd. Trustees; Alexander Cumming, Chn.

BUFFALO, N. Y.—I. G. Perry, State Arch., Albany, is preparing plans for a large addition to the Buffalo State Insane Asylum. It will be built of brick and red standstone, two stories high, 320 × 34 ft., and is estimated to cost $150,000. Bids will be asked for constructing it in a short time.——August Esenweins has prepared plans which have been accepted by the board of public works for a new 16-room school building on the Mineral Spring road. The structure will be of brick and stone, three stories in height, and is estimated to cost $45,000.

NEW YORK, N. Y.—B. Altman & Co., 301 Sixth Ave., contemplate erecting at 19th St. a structure which will be about double the size of their present building.

NEW YORK, N. Y.—It is reported that Maclay & Davies have sold the three three-story and basement brick dwelling properties Nos. 29, 31 and 33 East 19th St., for William F. Havemeyer, to Benjamin Silliman, for about $150,000. Mr. Silliman is having plans prepared for a 12-story fireproof store and office building.——Plans have been filed by Frederick Haas, 307 East 38th St., for a seven-story brick apartment house at West End Ave. and 91st St., to cost $105,000.

WALTON, N. Y.—Bids are asked until Sept. 16 for constructing an armory building at this place. Arch., I. G. Perry, Albany.

WHITE PLAINS, N. Y.—The Children's Temporary Home at White Plains is to be enlarged by the addition of a three-story and basement building, 180 × 100 ft. to cost $50,000, including all conveniences, such as steam-heating appliances, sanitary plumbing, dumb waiters, bath fittings, etc. Archs., Carrere & Hastings, 44 Broadway, New York.

YONKERS, N. Y.—It is stated that competitive plans for the new city hall in Yonkers will be called for by the council in a short time. The building is to cost $150,000. After the plan of the successful architect is accepted the council will give $150 to the architect whose plans are second best and $75 to the third best.

BARNEGAT, N. J.—It is reported that the roundhouse of the Long Beach R. R. at this place was destroyed by fire Sept. 3, together with its contents, including a locomotive and two cars.

JERSEY CITY, N. J.—Bids are asked until Sept. 17 for constructing a building for the fire department. Geo. F. Bouton, Clk. Comrs.

NEWARK, N. J.—Bids are asked until Sept. 17 for constructing an addition to the Elliott St. school building. R. D. Argue, Secy. Bd. Education.

ALLEGHENY, PA.—Bids are asked until Sept. 27 for erecting the superstructure, roof-covering, etc., for the U. S. public building in this city, as stated in our advertising columns. H. R. P. Hamilton, Acting Supervising Arch., Washington, D. C.

SCRANTON, PA.—It is reported that William Connell is to erect a 12-story building on Washington Ave., between Lackawanna Ave. and Spruce St.

WERNERSVILLE, PA.—Bids are asked until Sept. 16 for erecting five buildings for the state asylum for the chronic insane at South Mountain, Pa. Archs., Moses & King, 431 Walnut St., Philadelphia; Savery Bradley, Chn. State Asylum, Wernersville, Pa.

WASHINGTON, D. C.—Bids are asked until Sept. 24 for furnishing and delivering the following materials and work: Fine ironwork for reading room, and air-cushion enclosures for elevators; hardwood work for reading room and water closet doors; marble work for lavatories; marble tiling for main stair hall; mosaic floors for corridors, marble and granite floor for reading room, for the congressional library building. Bernard R. Green, Supt. and Engr.

GRAFTON, W. VA.—Bids are asked until Sept. 26 for erecting a building for the First National Bank. C. F. W. Kunst, Secy. Com.

ASHEVILLE, N. C.—The owners of the Battery Park Hotel have decided to make a number of improvements to the structure at an estimated cost of $50,000. Plans have been prepared and the contract will soon be awarded. Address Manager McKesslck.

NEW ORLEANS, LA.—Bids are asked until Sept. 17 for constructing buildings for the Cape San Blas lighthouse station, Florida. Maj. Jas. B. Quinn, U. S. Engr., New Orleans.

MARK CENTER, O.—Bids are asked by the board of Education of Mark township until Sept. 30 for building a school-house. L. E. Kitterman, Clk.

NORWOOD, O.—Bids will be received by Sweeney & Robinson, 540 Main St., Cincinnati, until Oct. 5 for the erection of an eight-room school building in Norwood. J. P. Zimmerman, Jr., Pres.; C. M. Flowers, Clk. Bd. Education.

RICHMOND, IND.—W. W. Alexander will build an apartment house.

CARTHAGE, ILL.—Bids are asked by Geo. W. Payne & Son, Archs., until Sept. 14 for the erection of a brick city hall, 50 × 80 ft. The work will be let in one general contract, including materials and labor. A. N. Sherrill, J. L. Callihan, H. A. Cutler, Committee.

CHICAGO, ILL.—Robert Rae, Jr., has prepared plans for a five-story apartment house at Wabash Ave. and 36th St., estimated to cost $125,000.

MILWAUKEE, WIS.—Bids are asked by the board of public works until Sept. 27 for constructing a museum and library building on Grand Ave., between Eighth and Ninth Sts. Bond, $150,000; G. H. Benzenberg, Cy. Engr.

KNOXVILLE, IA.—Bids are asked until Oct. 1 for constructing a new county court house. L. Van der Linden, Chn. Com.; Gus. D. Gamble, Attorney Marion County.

DENVER, COLO.—Bids are asked until Oct. 1 for interior work on the state capitol building. Herman Lueders, Secy. Bd. Managers.

GALLUP, N. MEX.—Bids are asked for constructing buildings at Fort Defiance, Ariz., for the Indian service. Capt. Constant Williams, U. S. A., Gallup, N. Mex.

BOISE CITY, IDAHO.—Chesney & Schroeder have prepared plans for a five-story building, 62 × 122 ft., to be erected at Main and 8th Sts. by Falk Bros. Estimated cost, $75,000.

OLYMPIA, WASH.—Bids are asked until Nov. 19 for constructing a new state capitol building, estimated to cost $1,000,000, as stated in our advertising columns. Arch., Ernest Flagg, 54 Broadway, New York, N. Y.; J. H. McGraw, L. R. Grimes, J. S. Allen, State Capitol Commissioners.

STREETS AND ROADS.

WARWICK, R. I.—It is reported that at a town meeting held recently it was voted to appropriate $3,000 for road-making machinery.

ANSONIA, CONN.—Bids are asked until Sept. 16 for 3,000 sq. yds. of dimension block paving, and until Sept. 26 for constructing a road, as stated in our advertising columns. Engr., David C. Sanford, 87 Church St., New Haven; H. J. Smith, Bd. Pub. Wks.; John C. Platt, Selectman.

EAST WINDSOR, CONN.—Bids are asked until Sept. 21 for macadamizing Main St., in Warehouse Point. E. M. Granger, Selectman, Broad Brook, Conn.

ESSEX, CONN.—Bids are asked until Sept. 18 for macadamizing a road. Geo. B. French, Selectman.

GRISWOLD, CONN.—Bids are asked until Sept. 17 for constructing a macadam road in Griswold, as stated in our advertising columns. Engr., C. E. Chandler, Norwich.

GUILFORD, CONN.—Bids are asked until Sept. 14 for constructing a macadam road. Engr., A. B. Hill, 82 Church St., New Haven; Samuel G. Hubbard, Selectman.

HAMDEN, CONN.—Bids are asked until Sept. 17 for paving. Engr., A. B. Hill; F. E. Tuttle, Selectman.

NEW HAVEN, CONN.—The committee has decided to pave portions of about 25 streets at an estimated cost of about $750,000. F. S. Hamilton, Chn. Com.

NEWINGTON, CONN.—Bids are asked until Sept. 14 for macadamizing Main St. Henry M. Robbins, Selectman.

NORTH BRANFORD, CONN.—Bids are asked until Sept. 18 for paving. Engr., A. B. Hill, New Haven; H. O. Page, Selectman.

NORTH HAVEN, CONN.—Bids are asked until Sept. 19 for paving, as stated in our advertising columns. Engr., David C. Sanford, 87 Church St., New Haven; Romanta T. Linsley, Selectman.

NORWICH, CONN.—Bids are asked until Sept. 16 for macadamizing a road in Norwich, as stated in our advertising columns. Engr., C. E. Chandler, Norwich, Conn.

PLAINFIELD, CONN.—Plans and specifications have been prepared for a macadam road in Central Village, Plainfield. W. S. Kenyon, Moosup, Conn., First Selectman; Engr., C. E. Chandler.

PRESTON, CONN.—Bids are asked until Sept. 25 for macadamizing a road in Preston, as stated in our ad-

vertising columns. Engr., C. E. Chandler, Norwich; C. B. Chapman, Selectman, Norwich.

POMFRET, CONN.—Bids are asked until Sept. 26 for constructing a macadam road, as stated in our advertising columns. Engr., C. E. Chandler, Norwich; Herbert Sharpe, Selectman.

PUTNAM, CONN.—Plans and specifications for macadam roads and drains have been prepared. Artemus H. Corbin, First Selectman; Engr., C. E. Chandler, Norwich.

ROCKYHILL, CONN.—Bids are asked until Sept. 17 for macadamizing a road for a distance of 2,520 ft. O. R. Havens, Selectman.

SEYMOUR, CONN.—Bids are asked until Sept. 19 for paving, as stated in our advertising columns. Engr., D. C. Sanford, New Haven; C. H. Lounsbury, Selectman.

VOLUNTOWN, CONN.—Bids are asked until Sept. 20 for constructing a macadam road in Voluntown, as stated in our advertising columns. Engr., C. E. Chandler, Norwich.

WATERFORD, CONN.—Bids are asked until Sept. 14 for macadamizing a portion of the Norwich turnpike. Engrs., Dabold & Crandall, 94 State St., New London; John L. Payne, Selectman.

WATERVILLE, CONN.—W. G. Smith, Town Engr., has completed specifications for macadamizing a road.

WINDSOR LOCKS, CONN.—Bids are asked until Sept. 17 for macadamizing portions of two roads. Thomas Hancock, Selectman.

FAR ROCKAWAY, N. Y.—Arrangements are being made to begin the work at once of macadamizing a road from Lynbrook to Lawrence, a distance of four miles, estimated to cost $20,000.

NEW YORK, N. Y.—Bids are asked by the commissioner of street improvements, 2622 Third Ave., until Sept 16 for paving two streets with granite blocks and grading one and paving one other with trap blocks.——Bids are asked by the department of public parks until Sept. 18 for 24,450 sq. yds. of asphalt paving, 16,500 sq yds. of retford macadam, 4,000 ft. stoneware pipe, etc.

ROCHESTER, N. Y.—Bids are asked until Sept. 20 for grading, paving, etc., portions of four streets. T. J. Neville, Clk.

SCHENECTADY, N. Y.—Ordinances have been passed for paving Ferry and Liberty Sts. with sheet asphalt.

SYRACUSE, N. Y.—Bids are asked until Sept. 16 for paving West Onondaga St. with asphalt, and a number of other streets with brick; two checks of $2,000 each. H. C. Allen, Cy. Engr.; H. F. Stephens, Cy. Clk.

TURTLE CREEK, PA.—Bids are asked until Sept. 14 for grading and paving 12 streets. P. G. Zischkan, Chn. Com.

WHITE PLAINS, N. Y.—Costello & Neagle, of Elmira, have been awarded the contract for 10,980 sq. yds. of brick paving, 5,400 lin. ft. of curbing, etc.

ATLANTIC CITY, N. J.—Press reports state as follows: At a recent meeting of the council the committee on streets reported favorably on an ordinance for a board walk of steel girders and supports from Massachusetts to Michigan Aves. It will be constructed this winter, and will be 48 ft. wide, and $100,000 has been appropriated to build it. The present board walk is but 24 ft. wide.——The Camden & Atlantic and West Jersey R. R. companies have offered to subscribe $40,000 to aid in the paving of Atlantic Ave., estimated to cost $100,000.

HOBOKEN, N. J.—Bids are asked until Sept. 25 for improving Third St. Robt. V. Curry, Asst. Cy. Clk.

CHESTER, PA.—Bids are asked until Sept. 16 for paving Ninth St. with brick. James B. Campbell, Cy. Clk.

RICHMOND, VA.—The committee has decided to recommend the council to advertise for bids for paving Hull St. with granite blocks. C. H. Sims, Chn. Com.

RALEIGH, N. C.—The aldermen have decided to submit to the vote of the people at the election in November a proposition to issue $50,000 in bonds for improving the streets.

JACKSONVILLE, FLA.—It is proposed to spend $175,000 for paving and improving streets.

DAYTON, O.—Bids are asked until Sept. 17 for paving certain streets. C. A. Herbig, Cy. Comptroller.

DAYTON, O.—Bids are asked until Sept. 20 for laying cement or asphalt sidewalks in 12 streets. C. A. Herbig, Cy. Comptroller.

ELKHART, IND.—Bids are asked until Sept. 25 for constructing sidewalks. Kit McKean, Cy. Clk.

INDIANAPOLIS, IND.—Bids are asked until Sept. 21 for about 11,000 lin. ft. of cement sidewalks and 2,000 sq. yds. of asphalt paving. C. C. Brown, Cy. Engr.; J. H. Deane, Asst. Engr. of Sts.

MILTON, IND.—It is reported that a large number of cement sidewalks are to be constructed at this place.

SOUTH BEND, IND.—Bids are asked until Sept. 23 for constructing cement sidewalks in five streets. L. A. Hull, Cy. Clk.

DETROIT, MICH.—The board of public works received bids Sept. 7 for paving Washington Ave. with asphalt, as follows; Bermudez Asphalt Paving Co., $27,429; Warren-Scharf Asphalt Paving Co., $29,076; Barber Asphalt Paving Co., $28,205. The Bermudez Co.'s bid is at the rate of $2.20 per sq. yd. for concreting and asphalting, or $2.97 a yard for the whole pavement, including curbs and excavation. The board of public works expected a bid $3,000 cheaper, and will probably readvertise the work.

JACKSON, MICH.—Bids are asked until Sept. 13 for 14,000 sq. yds. of brick paving. C. P. Hunt, Secy. Bd. Pub. Wks.; J. K. Bogert, Supt.

WAUKEGAN, ILL.—The council has passed an ordinance for macadamizing State St., estimated to cost $37,483.

MADISON, WIS.—Bids are asked until Sept. 14 for 4,000 sq. yds. of asphalt, granolithic and cement sidewalks and driveways in the capitol grounds. C. E. Morley, Supt. Pub. Property.

OSHKOSH, WIS.—Bids are asked until Sept. 16 for paving Algoma St. with cedar blocks; sureties, $5,000. W. T. Ellsworth, E. F. Graves, F. Lampert, Bd. Pub. Wks.

DULUTH, MINN.—Engineer Lewis has made a survey for a highway from West Duluth to Fond du Lac. The route has been approved by the board of public works.

KANSAS CITY, MO.—The West Side Improvement Club has begun to urge the park commissioners to pave Broadway with asphalt. The following committee has been appointed to secure signatures to a petition: T. Mulford, R. M. Godfrey, Z. O. Smith, E. I. Farnsworth and J. Brumback.

ST. LOUIS, MO.—Bids are asked until Sept. 17 for macadamizing portions of 15 streets. Robt. E. McMath, Pres. Bd. Pub. Improvements; E. S. Foster, Secy.

CREEDE, COLO.—The Mineral Toll Road Co. has been incorporated with a capital stock of $10,000, by J. W. Robb, Albert Wood, A. J. Chapman, E. Higgin, and L. J. Chapman. This company will construct a wagon road and collect toll for travel thereon through Mineral county.

DENVER, COLO.—Bids are asked until Sept. 18 for paving Court Place with sheet asphalt; check, $5,000. E. Monash, Pres. Bd. Pub. Wks.

TORONTO, ONT.—The council proposes to macadamize Berkeley St., at an estimated cost of $6,800, and Brunswick Ave., with cedar blocks at a cost of about $3,000. John Blevins, Cy. Clk.

WATER-WORKS.

DAMARISCOTTA, ME.—The citizens are talking of constructing a system of water-works.

MACHIAS, ME.—The Machias Water-Works Co. will put in works here next year, according to reports.

SOMERSWORTH, N. H.—Bids are asked until Sept. 16 for pumping machinery and boilers, as described in detail in our advertising columns. Engr., Wm. Wheeler, 89 State St., Boston; F. L. Shapleigh, Secy. Com.

LEOMINSTER, MASS.—Press reports state that at a recent town meeting the town voted $103,000 to build a large reservoir on Fall Brook, two miles above the town.

WESTERLY, R. I.—The town council has voted to appropriated $500 for the purpose of purchasing land necessary in the construction of works, and the town council will proceed at once to construct waterworks for the town.

NEW HAVEN, CONN.—At a recent meeting of the directors of the New Haven Water Co. a committee, consisting of President Whitney, John J. Leeds and Richard M. Everit, was appointed to investigate the matter of filtration.

BUFFALO, N. Y.—The contract for the four boilers for the new 30,000,000-gallon pumping engine has been awarded to Riter Bros. at $21,150. The mayor has approved the awarding of the contract for the pumping engines to the Lake Erie Engineering Works.

CHARLOTTE, N. Y.—Milton McIntyre, Geo. Clark, D. J. Kerr., W. C. Morse and John Cook have been appointed commissioners to investigate the question of works.

CLINTON, N. Y.—C. H. Smythe, Matthew Tunnock, J. L. Dempsey and others have qualified as a board of water commissioners.

COLD SPRING, N. Y.—Bids are asked until Sept. 27 for constructing works, as stated in our advertising columns. Engr., Francis Henry, 120 Broadway, New York; Henry Metcalfe, Pres. Comrs.

DELEVAN, N. Y.—The Delevan Water Co. was recently incorporated with a capital stock of $15,000. The directors are E. W. Reed, Frederick Kirchbell, L. J. Cheney and others.

LE ROY, N. Y.—The water-works committee has decided to sink one or more additional wells, and has given the contract to Burton & Crone, of Honeoye Falls.

LESTERSHIRE, N. Y.—E. H. Codding, Village Clk., writes us that the village will hold a special election to vote on the question of purchasing the present works, when completed.

MARLBORO, N. Y.—Press reports state that the water-works company is having plans made for a new reservoir.

MOUNT MORRIS, N. Y.—The contract for constructing works at the Craig Colony at Sonyea, as advertised in Engineering News, has been awarded to L. J. Richardson, Eddy valves and hydrants and Worthington pump to be used. The bids were as follows; Engrs., Voorhees & Witmer, Buffalo.

Cast Iron Pipe and Special Castings.

Jackson & Woodin, Berwick, Pa.	$4,735.50
Addyston Pipe & Steel Co., Cincinnati, O.	4,779.10
R. D. Wood & Co., Philadelphia, Pa.	4,868.70
Chattanooga Pipe Co., Chattanooga, Tenn.	4,589.50

	Valves and Hydrants.	boxes.
Eddy Valve Co., Waterford, N. Y.	$341.25	$295.85
Chas. Millar & Co., Utica, N. Y.	360.00	312.93
F. B. Hawkins & Co., New York	352.50	260.25
Ludlow Mfg. Co., Troy, N. Y.	360.00	312.93
R. D. Wood & Co., Philadelphia, Pa.	352.00	324.00

Pumping Station Buildings.

L. J. Richardson, Owego, N. Y.	$4,850.00
W. B. Wilson, Buffalo, N. Y.	5,072.00

Pumps.

Henry R. Worthington, New York	$2,200.00

NAPLES, N. Y.—J. F. Witmer, Engr., informs us that at the recent letting the contract for the construction of the works was awarded to Geo. S. Miller & Co., of Council Bluffs, Ia. The hydrants will be furnished by the Michigan Brass & Iron Works, Detroit, Mich; the valves and boxes by the Eddy Valve Co., of Waterford, N. Y., and the pipe and specials by R. D. Wood & Co., Philadelphia, Pa.

NEW YORK, N. Y.—The following bids were received Aug. 30 for a tower, tunnel and crib-work to convey coal from the Harlem River, under the proposed speedway, and up to the new high-service engine house, near Washington Bridge: J. R. F. Kelly & Co., $24,375; W. J. Rogers, $24,470; P. J. Moran, $25,350; Thomas Dwyer, $25,770; Patrick E. Burns, $27,000. J. R. F. Kelly & Co., 26 Cortlandt St., who were the lowest bidders, are now constructing the new high-service engine house.

NYACK, N. Y.—The citizens have decided, by a vote of 134 to 13, to bond the city for $100,000 to erect water-works.

RIPLEY, N. Y.—The Ripley Water Supply Co. has been incorporated with a capital stock of $15,000 to supply this town with water. Directors, John M. Wethy, Fred N. Randall, J. Watson Burrows and others.

SANDUSKY, N. Y.—G. N. Cowan, Attorney and Engr., Delevan, N. Y., writes us that the Cattaraugus & Wyoming Water Supply Co. is being organized to supply this village, and will extend its mains to the villages of Arcade, Arcade Station and Yorkshire. The supply will be by gravity from springs; capital stock, $40,000; principal office, Arcade, N. Y.; directors, John Hunt, Dr. F. Brehbiel and G. N. Cowan, of Delevan; J. H. Shalles and B. B. Lewis, of Sandusky; W. H. Cowan, of Montgomery, and W. R. Brack, of Almeda, N. Y. The surveys have been completed and rights of way secured. The construction will be commenced this fall or early in the spring.

THERESA, N. Y.—Plans and estimates for a water-works system have been submitted by O. E. Bond, of Watertown. The people are reported in favor of the enterprise.

TULLY, N. Y.—J. H. Wright, W. A. Dewey and Chas. Waite are members of the board of water commissioners recently appointed. A special election will be held Sept. 14 to vote on the question; estimated cost, $8,000 to $10,000.

WEST CARTHAGE, N. Y.—Bids are asked until Sept. 26 for the construction of works; Engrs., Hinds & Bond, of Watertown; Geo. G. Hewitt, Pres. Comrs., Carthage, N. Y.

JERSEY CITY, N. J.—Bids are asked until Sept. 17 for re-setting three boilers at the Belleville Station. Address W. H. Hooker, Chn. Com.——The board of finance has concurred in the award of the contract for a supply to the Jersey City Water Co. at $7,950,000.

ALLEGHENY, PA.—The contract for the intake crib at Montrose has been awarded to Hulings Bros., at $69,085. The other bids were: G. Kaufman, $78,250; Jutte, Foley & Co., at $72,200. The bids for six boilers were as follows: National Water Tube Boiler Co., Philadelphia, with Murphy stoker, $43,950; with other than Murphy stoker, $38,700; Sheriff Mfg. Co., $38,700; without foundation, $25,700; stokers, $6,500 extra. James Rees & Sons, $41,500; with Murphy stokers, $47,500; with stokers and smokeless furnaces, $49,500. Edgemore Iron Co., $46,700; with Hawley stoker, $45,200. Babcock & Wilcox, furnaces, with their own stokers, $63,635. Heine Safety Boiler Co., smokeless furnace, with Murphy stoker, $54,500. Riter & Conley, with Viker stoker, $71,500; with Hawley down-draft furnace, $70,000. The committee will inspect the work of the competing boiler firms before awarding the contract.

CARLISLE, PA.—The Carlisle Water Co. will apply for a charter Sept. 27. The water supply will be from Boiling Springs, 4½ miles distant, and at an elevation of 140 ft.; capital stock, $200,000; Pres., W. A. Mullin; Treas., J. C. Bucher. H. T. Duke, of the Cumberland Water Co., of Boiling Springs, is interested.

COATESVILLE, PA.—H. W. Kennedy, of Philadelphia, has been awarded a contract for the sinking of a number of artesian wells to secure an abundant water supply.

EPHRATA, PA.—Bids are asked until Sept. 28 for the construction of works, as stated in our advertising columns. H. F. Hermes, Clk.

GROVE CITY, PA.—A new water-works company has been organized: Pres., D. J. C. Ketler; Vice-Pres., T. M. Martin; Secy., W. J. Harshaw; Treas., William A. Young.

PHILADELPHIA, PA.—Specifications are now being prepared for making the repairs to the Queen Lake reservoir recommended in the report of the experts.

STRASBURG, PA.—The Strasburg Water Co. has been incorporated with a capital stock of $18,000, with $1,800 paid in; Treas., George W. Hensel, Strasburg.

BRUNSWICK, MD.—The question of establishing a system of water-works is being agitated.

WASHINGTON, D. C.—Bids are asked by the district commissioners until Oct. 21 for furnishing and erecting an 8,000,000-gallon pumping engine, with boilers, etc., as stated in our advertising columns.

BRISTOL, VA.—Bids will be received until Sept. 26 for constructing a reservoir. J. A. Stone, Cy. Clk.

CHARLOTTE, N. C.—Press reports state that the water supply contemplates putting in a filter plant. D. B. Hutchinson, Supt.

GAFFNEY, S. C.—This city is contemplating the construction of water-works. Address F. G. Stacy.

DUBLIN, GA.—This city is reported as about to construct a system of water-works and an electric light plant. James B. Sanders, Mayor.

JACKSONVILLE, FLA.—An ordinance has recently been passed authorizing an expenditure of $217,125 to extend and improve the water-works system.

AUGUSTA, GA.—The council has voted to petition the next legislature for permission to increase the water supply by constructing new works beyond the city limits.

NEW ORLEANS, LA.—There is talk of constructing works in Algiers, being the fifth district of this city, but separated from the main part of the city by the Mississippi River. L. H. Gardner is superintendent of the New Orleans Water Co.

COLUMBIANA, O.—The contract for constructing works has been awarded to Simon Harrold, of Beaver Falls, Pa., at about $29,000. Mr. Harrold is said to be interested in the Enterprise Mfg. Co., of Columbiana, and will furnish all the materials for the plant excepting fire hydrants.

CLEVELAND, O.—Bids are asked until Oct. 9 for constructing a wooden protection crib in Lake Erie; for setting four tubular boilers in the Division St. pumping station, and equipping them with mechanical stokers, or smoke-preventing devices; and for furnishing two traveling cranes of 15 tons capacity each for the Division St. pumping station. Darwin E. Wright, Dir. Pub. Wks.

DELPHOS, O.—This city has voted to issue $75,000 in bonds for works.

EAST CLEVELAND, O.—Chas. L. Parmelee, of Toledo, has been engaged to investigate the ground water supply obtainable in the hills south of this village, with a view to the construction of works. J. D. Cook, of Toledo, Consult. Engr.

HIRAM, O.—An engineer is reported to have been making estimates for works at this place.

MILLERSBURG, O.—The contract for works, as advertised in Engineering News, has been awarded to Snyder & Williams, of Dayton, O., at $17,587. Engr., Burton J. Ashley, 720 Chicago Opera House, Chicago.

MOUNT STERLING, O.—Bids are asked until Oct. 1 for constructing works, as described in our advertising columns. Engr., E. C. Cooke, Cleveland; John W. Hanawalt, Clk.

TIPPECANOE CITY, O.—Bids are asked until Sept. 21 for furnishing plans and specifications for works, as stated in our advertising columns. E. A. Jackson, Clk.

EVANSVILLE, IND.—The water board has rejected all the bids recently received, and will probably re-advertise. L. Weinheimer, Clk.

ALBION, IND.—The Albion Water Co. has been incorporated with a capital stock of $20,000.

GRAND RAPIDS, MICH.—The board of public works is considering the abandoning of the stand pipe and a plan for dumping direct to the service pipes.

MOUNT CLEMENS, MICH.—The commissioners are considering the advisability of securing a water supply from the lake.

THOMPSONVILLE, MICH.—It is stated that works will be put in at this place.

CAIRO, ILL.—The Cairo Water Co. is reported about to make improvements to cost $10,000. The work will include an intake crib 150 ft. long and 60 ft. wide, to be sunk in the bed of the river.

CHICAGO, ILL.—Bids are asked until Sept. 17 for furnishing all materials and laying mains in 20 streets. W. D. Kent, Comr. Pub. Wks.

ELMWOOD, ILL.—Bids are asked until Sept. 26 for laying about three miles of water mains, etc., as stated in our advertising columns. Chas. F. Sturtevant, Engr.; Z. L. Gilbert, Cy. Clk.

GALESBURG, ILL.—It is stated that this city has adopted the meter system and is now selecting a meter for general adoption.

MOMENCE, ILL.—Chas. B. Astle, Cy. Clk., writes us that the contract for constructing works, as advertised in Engineering News, has been awarded to John Synon & Co., of Chicago. The bids were as follows:

Seckner Cont'ing Co., 79 Dearborn St., Chicago	$34,853
John Synon & Co., 249 Harrison St., Chicago	29,400
S. I. Pope Co., Medinah Temple Bldg., Chicago,	29,800
Meeby & McKinstry, Momence, Ill.	31,493
Lillie & Blatchford, Kankakee, Ill.	34,427
Carson & Co., Danville, Ill.	30,600

WARREN, ILL.—The contract for works as advertised in Engineering News has been awarded to the U. S. Wind Engine & Pump Co., of Batavia, at $7,875. The Dubuque Const'n. Co., Dubuque, Ia., bid $7,960, and Crellin & Lovell, of Des Moines, Ia., $8,064, or $7,300 for a steel tower, the specifications calling for a stone tower. Preston T. Hicks, Cy. Engr.

LENA, ILL.—The contract for a pumping plant has been awarded to the U. S. Wind Engine & Pump Co., of Batavia, at $5,840. The other bids were as follows: Rockford Construction Co., Rockford, Ill., $9,600; Fairbanks, Morse & Co., Chicago, Ill., $7,215; Challenge Wind Mill & Feed Mill Co., Batavia, Ill., $5,840; Crellin & Lovell, Des Moines, Ia., $6,306. The contract for the mains will be awarded later.

LANCASTER, WIS.—The lowest bid for constructing works was that of E. C. Blake & Co., of Dubuque, Ia., at $32,900. It is stated that the appropriation is only $24,000.

PARDEEVILLE, WIS.—The citizens are considering the advisability of constructing works.

SHARON, WIS.—The citizens have decided to put in water works at this place and work has already been commenced on the well.

SHELL LAKE, WIS.—Captain Bourne, of this place, will extend the water main into the lake 300 ft. further.

SOUTH MILWAUKEE, WIS.—Bids are asked until Sept. 17 for furnishing plans and specifications for a brick stand-pipe or water-tower, base to be of cut stone, and tank to be of steel, with a capacity of 75,000 to 100,000 gallons; height, 90 ft. F. J. Boyle, Village Clk.

WATERTOWN, WIS.—J. T. Moak, Mayor, writes us that local capitalists will construct works estimated to cost $90,000. The city will manage and control the plant. Water supply from artesian wells. The work will be commenced at once.

BELMOND, IA.—The citizens have voted to issue bonds to construct works, estimated to cost about $6,000.

LAKE MILLS, IA.—The contract for constructing water-works has been awarded to Jackson & Moss, of Des Moines, Ia., at $4,365. The other bidders were Crellin & Lovell, Des Moines, Ia., $4,533; Challenge Wind Mill & Feed Mill Co., Batavia, Ill., at $4,297.

OTTUMWA, IA.—The South Ottumwa Water Co. will soon apply for a franchise.

FERGUS FALLS, MINN.—The citizens have decided to purchase a water power for $5,000, and will then operate its own electric light plant and water-works.

ST. CHARLES, MINN.—Bids will be received until Sept. 21 for the purchase of $17,000 of water-works bonds. N. D. Gould, Cy. Recdr.

ASPEN, COLO.—The Castle Creek Water Co. is making surveys for extensions of the service in East Aspen.

GALVESTON, TEX.—The commissioners are reported as in favor of adopting the meter system.

HILLSBORO, TEX.—D. A. Poyner, of Dallas, Tex., has been engaged to superintend the construction of a water-works plant at this place. The system will cost about $28,000.

POMONA, CAL.—J. R. Garthside, Cy. Clk., writes us that an election for the purpose of voting bonds for a water-works system will be held about Nov. 1. W. H. Sanders, Cy. Engr.

TILBURY, ONT.—The citizens have voted to put in a water-works system.

HAWAIIAN GOVERNMENT.—Bids will be received at 51 Leonard St., New York, until Sept. 17, for 1,464 ft. of 18-in. cast iron water pipe, as stated in our advertising columns. E. H. Allen, Consul General.

IRRIGATION.

DENVER, COLO.—Press reports state as follows: The Pawnee Pass Reservoir Co. has filed a request with the state land board to be sent to the secretary of the interior to segregrate 300,000 acres of land in Logan county for reclamation under the arid land law. The company is represented by R. C. West of Greeley, Colo. The proposition of the company is to construct a reservoir to hold 1,500,000,000 cu. ft. of water, which will be sufficient to irrigate 300,000 acres of land. The ditch which will be constructed will be 50 miles long.

SAN FRANCISCO, CAL.—Press reports state that Gen. O. O. Howard, of Chicago, Ill., and his brother have severed their connection with the Columbia Colonization Co., of San Bernardino. The company proposes to construct a dam at the Victor narrows, on the Mojave River, and by means of a natural reservoir to store water enough to irrigate 300,000 acres on the desert. Messrs. Foster, Sweet and several other Chicago capitalists are behind the scheme and announce their intention of proceeding with the work.

POCATELLO, IDAHO.—The U. S. government has made an agreement with the Bannock Indians to build an irrigation canal 50 miles long in the Bannock reservation for irrigating about 150,000 acres, the water to be taken from Snake River. It is stated that bids are now being considered by the government officials at Washington, D. C., and that the contract will be awarded soon so work can be begun this month.——A 3,500,000-gallon storage reservoir is now being built on the Bannock reservation by the Pocatello Electric Light, Telephone & Irrigation Co. Chas. W. Spalding, Daniel Twinehart and Francis W. Smith are interested.

NEW COMPANIES.—San Antonio Irrigation Co., San Antonio, Tex.; to build a canal 25 miles long and 14 ft. wide to irrigate 25,000 acres of land; Z. O. Stocker, of San Antonio; J. S. Taylor, Laredo, Tex.

SEWERAGE.

BUCKSPORT, ME.—At a town meeting held Sept. 7 the question of constructing a main sewer 700 ft. long was discussed.

EASTHAMPTON, MASS. — The town treasurer has been authorized to issue $6,300 in sewer bonds, $1,000 for road work, and $2,200 for a steam road roller, besides about $16,000 in bonds for other work.

NAUGATUCK, CONN. — The construction of a system is being discussed. E. C. Barnum, Secy.

NEW HAVEN, CONN.—The following bids were received by the board of public works Sept. 4 for constructing a sewer in Congress Ave.: Dowling & Maher, $7,170 (awarded contract); C. W. Blakeslee & Sons, $7,956; A. Brazos & Son, $8,174; Gorman, Wharton & Bowden, $7,510. Dowling & Maher were also awarded the contract for building a sewer in Orchard St., at $3,380.

ROCKVILLE, CONN.—It is reported that the contract for the construction of the system of sewers has been awarded by the committee to Chaffee, Lyons & Gamino, of Providence, R. I., at about $55,000. The contract for 2,000 bbls. of Rosendale cement has been awarded to Thos. A. Lake, of Rockville, and the iron-work to the Morgan Iron Works, of New London.

CENTRAL FALLS, R. I.—Bids are asked until Sept. 14 for constructing 1,500 ft. of pipe sewers. John Booth, Secy. Bd. Pub. Wks.

NORWOOD, MASS.—The question of constructing sewers is being urged.

ALBANY, N. Y.—Bids are asked until Sept. 16 for constructing 18 to 6-in. pipe sewers in two streets. Thos. J. Lanahan, Clk. Bd. Contract.

DEPEW, N. Y.—It is reported that at a meeting of the Citizens' Association and taxpayers it was voted to issue $60,000 in bonds for constructing a main sewer and to establish a sewage disposal plant. Engineer Guthrie, of Buffalo, has been directed to prepare estimates of the cost. D. E. Russell, Chn. Com.; J. A. Spoor, of Chicago, Ill., Vice-Pres. Depew Improvement Association.

DUNKIRK, N. Y.—The council proposes to construct 15 and 10-in. pipe sewers in five streets. J. K. MacDonald, Cy. Engr.; J. F. Maloney, Cy. Clk.

FAR ROCKAWAY, N. Y.—The taxpayers voted Sept. 9 in favor of constructing 15 miles of sewers, plans for which have been prepared by Alexander Potter, 137 Broadway, New York, and have received the approval of the state board of health. The system is estimated to cost $75,000. A sewage disposal plant will also be constructed. Bids for the work will probably be asked next week. Treas., Brockholst L. Carroll; Pres., John Renehan.

JAMAICA, N. Y.—It is stated that plans for the proposed sewer system for Jamaica, to be 52 miles long, have been completed. Dr. P. M. Wood, of the commission, and J. J. McLaughlin, Engr., have been appointed a committee to arrange a meeting between the commissioners and the state board of health, for the approval of the plans.

NEW YORK, N. Y.—Bids are asked by the commissioner of street improvements until Sept. 16 for constructing sewers in 10 streets.

ROCHESTER, N. Y.—Bids are asked until Sept. 16 for constructing sewers in two streets. Thos. J. Neville, Clk. Executive.

ROME, N. Y.—The council has passed a resolution ordering a special election, to be held Sept. 30, for the purpose of determining whether the city shall issue $240,000 in bonds for a system of sewerage.

SYRACUSE, N. Y.—Bids are asked until Sept. 16 for constructing 60 to 30-in. brick and 15-in. pipe sewers in several streets. Henry C. Allen, Cy. Engr.

TROY, N. Y.—Bids are asked until Sept. 20 for constructing pipe sewers in 17th St. E. O. Ross, Cy. Contract Bd.

WARSAW, N. Y.—The board of trustees has decided to build sewers in four streets.

CAMDEN, N. J.—The following contracts for sewer work have been awarded: Senate St., B. F. Sweeten & Son, at $1.05 per lin. ft., and Master St., at $1.10 per lin. ft.; Third St., F. A. Ward, at 91 cts. per lin ft.

JERSEY CITY, N. J.—It is proposed to construct a main sewer in 11 streets and branch sewers in 12 streets. Geo. T. Bouton, Clk. Bd. St. Comrs.

JERSEY CITY, N. J.—Bids are asked until Sept. 17 for constructing 460 ft. of 18-in. pipe sewers in 16th St. J. C. Kaiser, Chn. Com.——The street commissioners have received the following bids for constructing pipe and brick sewers in Nelson Ave.: W. P. Ard, Jersey City, $22,008; P. H. Flaherty, Jr., Hoboken, N. J., $23,350; B. Garmon, Jersey City, $13,835; J. Hopkins, Jersey City, $16,867; P. T. Punkett, Jersey City, $15,646; P. O'Neill, Jersey City, $17,625.

NEWARK, N. J.—Bids are asked until Sept. 17 for constructing about 1,400 ft. of 12-in. pipe sewers. J. C. Mundy, Gen. Supt. Pub. Wks.

PLAINFIELD, N. J.—The specifications have been completed and bids will soon be asked for constructing sewage disposal beds. Constructing Engr., A. J. Gavett.

WEST HOBOKEN, N. J.—Bids are asked until Sept. 18 for constructing pipe sewers in Traphagen St. and Central Ave. L. A. Farr, Town Clk.——The council has been petitioned to construct a 30 × 20-in. brick sewer in Hill St.

ALTOONA, PA.—Bids are asked until Sept. 14 for constructing a pipe and brick sewer with masonry and iron intake and masonry outlet. Harvey Linton, Cy. Engr.; W. L. Shellenberger, Chn. Com.

KINGSTON, PA.—The council is considering the question of constructing sewers, according to reports.

PHILADELPHIA, PA.—Bids are asked until Sept. 17 for constructing main and branch sewers and new inlets, etc. Thos. M. Thompson, Dir. Dept. Pub. Wks.

BALTIMORE, MD.—Bids are asked until Sept. 17 for furnishing about 22,000 sewer blocks. Janon Fisher, Cy. Comr.

WASHINGTON, D. C.—The district commissioners have ordered the construction of about 2,700 ft. of pipe sewers at an estimated cost of $18,000.——The following contracts have been awarded for constructing sewers: Eckington Ave.—B. J. Coyle, $29,575 for brick sewer, $26,730 for concrete sewer; Potomac St.—Lyons Bros., $3,227 for brick, $2,799 for concrete; 10th St.—Darius Gaskins, $3,874 for brick, $3,452 for concrete sewers.

JACKSONVILLE, FLA.—The council has passed an ordinance authorizing the bond trustees to issue $168,000 in bonds for extending the sewers.

TOLEDO, O.—Bids are asked until Sept. 16 for constructing a 20-in. brick sewer in Whitney Ave. L. P. Harris, Cy. Clk.

INDIANAPOLIS, IND.—Bids are asked until Sept. 17 for constructing 8,092 ft. of 75 to 32-in. brick sewer and 4,000 ft. of 6-in. house connections, and until Sept. 21 for constructing 2,000 ft. of 24 to 15-in. pipe sewers and about 500 ft. of 6-in. house connections. Chas. C. Brown, Cy. Engr. B. J. T. Jeup, Asst. Engr. of Sewers.

TERRE HAUTE, IND.—A resolution has been introduced in the council authorizing Geo. H. Simpson, of Terre Haute, to make surveys and prepare plans for the proposed belt sewer and have them submitted to Rudolph Hering, of New York. The survey is to be made at once so that bids for the construction of the sewer may be received this winter and the contracts let in time for work to begin early in the spring.

PORT HURON, MICH.—Bids are asked until Sept. 14 for constructing a system for the 9th and 10th wards. The plans call for 520 ft. 24-in. pipe, 1,500 ft. 18-in. pipe, 1,950 ft. 15-in. pipe, 2,010 ft. 12-in. pipe, 11,750 ft. 10-in. pipe, 2,720 ft. 8-in. pipe, 6 flush tanks, 27 manholes, 40 catchbasins and 910 connections. F. F. Rogers, Cy. Engr.

CHICAGO, ILL.—Plans and specifications have been completed for a sewer 12 ft. in diameter, to begin at the shore of Lake Michigan in South Chicago, and to flow into the Chicago River at 39th St. This sewer is designed to drain 16½ miles of territory, and marks the first step toward conformity of the sewerage system of the city with the conditions which will result from the completion of the drainage canal. Instead of emptying into the lake, this sewer will begin at the lake and run northwesterly, emptying into the Chicago River. Pumping works will be constructed midway between the lake and river, by which the contents of the sewer will be lifted 27 ft. and thence carried to the river. Chief Engineer Clausen, of the sewer department, estimates the cost of the sewer, including the pumping works, at $1,295,000, and says it can be completed by the time the drainage channel is opened. The ordinance will be introduced at the next meeting of the council.

KANSAS CITY, KAN.—Contracts are soon to be awarded for constructing 60 to 24-in. brick sewers at an estimated cost of about $50,000. Engr., C. O. Ellis.

INDEPENDENCE, MO.—An election is to be held soon to vote on the question of issuing bonds for building a system, the main sewer of which is estimated to cost $45,000, as noted in our issue of Sept. 5. Engr., Wynkoop Kiersted, Kansas City, Mo.

SEDALIA, MO.—The construction of a system for a new district is proposed. M. Yeates, Cy. Engr.

SEATTLE, WASH.—The council is considering a resolution for extending the main sewer in Sixth St.

FRESNO, CAL.—Bids are asked until Sept. 16 for furnishing about 42,000 ft. of 14 to 6-in. sewer pipe, 700 18 to 6-in. Y's, etc. J. W. Shanklin, Cy. Clk.

WOODSTOCK, N. B.—Bids are asked until Sept. 25 for constructing about 12,000 ft. of 20 to 8-in. pipe sewer with depths of from 16 to 4 ft., as stated in our advertising columns. W. S. Saunders, Mayor.

OTTAWA, ONT.—The city engineer has completed plans for a proposed new sewer system by which it is proposed to construct 76 to 26-in. brick main and outlet sewers estimated to cost $543,895.

GARBAGE DISPOSAL.

NEW YORK, N. Y.—The board of estimate has unanimously voted to instruct the commissioner of street cleaning to advertise for bids for the receiving of the various dumps in the city, and finally disposing of all ashes, garbage and other refuse matter collected and delivered at the said dumps by carts of the city or by private carts. The ashes may be deposited at Riker's Island.——The garbage crematory recently built at 53d St. and 12th Ave., by Herbert Tate, has been completed, and is said to be able to burn 60 tons of refuse a day, at a cost of about $25 a day. This furnace cost $5,800.

LANCASTER, PA.—Dr. D. R. McCormick, of the board of health, has recently investigated the method of garbage disposal at Syracuse, N. Y.

CHICAGO, ILL.—The health commissioner is selecting locations for four garbage crematories. The "Times-Herald" states that propositions have been made by the Rider Furnace Co., the Dickson Crematory Co., the Chicago Chemical & Reduction Co., and J. B. Rose for the construction of the crematories. These firms offer to put in their plants free of cost, with the expectation that the city will purchase them if satisfactory. The cost of the plants will vary from $8,200 to $16,000.——W. S. Johnson has invented and patented a crematory that is expected to burn 250 tons of refuse a day. The American Refuse Crematory Co. has built an experimental furnace at 45th and Lincoln Sts., and offers to burn the garbage of the city for 25 cts. a ton. The garbage is estimated at 700 tons a day. A short description of the Johnson furnace is given in the "Inter-Ocean" of Aug. 31.

DENVER, COLO.—The contract for collecting garbage for the next four months has been awarded to P. W. Terry, at $400 a month. It is stated that Geo. H. Graham has had the contract for the last two years at $820 a month.

OAKLAND, CAL.—The board of public works has been directed to advertise for bids for the collection and disposal of all garbage, etc., for one year.

MANUFACTURING PLANTS.

EAST-INDIAN LATH.

PROVIDENCE, R. I.—A press report states that the Interlaken Co., one of the largest manufacturing corporations in the state, will begin the erection at once in Arkwright of a mill to cost $1,000,000 and to have a capacity of 40,000 spindles, for the production of cotton cloths.

WOONSOCKET, R. I.—The Glenark Knitting Co. awarded a contract Sept. 5 for a new yarn mill to cost nearly $100,000.

WATERBURY, CONN.—The Rogers & Hamilton Co. is reported about to erect an entirely new plant on 12 or 14 acres of ground recently purchased. There will be three main buildings, one 35 × 298 ft., another 30 × 218 ft., and a third 37 × 194 ft. The latter building will have engine and boiler rooms, and a vault for tools, etc. The plant will be a model one and will be of brick, mill construction, with gravel roof.

CHESTER, PA.—John Coldrick is reported as interested in the establishment of a brewery in the vicinity of Second and West Sts., South Chester.

PHILADELPHIA, PA.—The Link Belt Engineering Co. is reported about to build a large addition to its plant at Nicetown.

GIBSONVILLE, N. C.—A cotton mill is being built at this place by a company of which B. Davidson is president, and is to be known as the Hiawatha Mfg. Co. An electric-light plant will probably constitute a part of the equipment.

GOLDSBORO, N. C.—The Goldsboro Cotton Mill Co. has been organized with $60,000 paid-up capital, and power to increase this to half a million. It buys the old cotton mill and will put in new spinning machinery and enlarge the mill. Pres., Henry Weill.

GREENSBORO, N. C.—Messrs. Moses and Caesar Cone, of New York, have purchased the buildings and grounds of the Co-operative Cotton Factory, at this place, and will equip a first-class spinning cotton mill on the property. The same parties are also interested in two other cotton mills, which are to be built at this place during the present fall.

HILLSBORO, N. C.—The Eno Cotton Mills will erect a new plant next spring, with a capacity of 10,000 spindles. The equipment will include a 250-HP. engine and an electric light plant. Address James Webb, Jr.

REIDVILLE, N. C.—J. W. Arrington, Treas., and associates, are building a cotton mill at this place. The buildings will soon be completed and machinery for the equipment will be purchased this fall.

ROCKINGHAM, N. C.—Robt. L. Steele, Pres., will soon purchase the equipment, including an electric-light plant, for the cotton mill which his company is building at this place.

ANDERSON, S. C.—A company of which R. S. Hill is president will build a cotton mill at this place, to cost $250,000. The equipment will include an electric-light plant.

MIDVILLE, GA.—A cotton yarn mill is to be built and equipped at this place by A. W. Jones and associates.

NEW ORLEANS, LA.—The New Orleans Cotton Mfg. Co. has been incorporated with these officers: Pres., Ernest V. Reiss; Vice-Pres., L. P. Newman; Secy. and Treas., A. L. Center; capital stock, $100,000.

MISHAWAKA, IND.—The Kaum & Schellinger Brewing Co. is said to be considering plans for the extensive enlargement of its plant early next season.

MUNCIE, IND.—The Indiana Bridge Co. is about to commence work upon a large addition to its plant. It will include a foundry department for the manufacture of architectural ironwork.

JOLIET, ILL.—The Illinois Steel Co. commenced work last week on a $200,000 spike mill.

STRASBURG, ILL.—Charles Quast, formerly Supt. Quast Gas & Gasoline Engine Co., Bucyrus, O., has organized the Quast Gas Engine Co., of this city, and is in the market for machines to equip a machine shop and foundry.

HOUSTON, TEX.—The Dickson Car Wheel Co. proposes to erect a foundry for the manufacture of architectural work, machinery, etc. The company will also build a machine shop.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

PONTOON DRY DOCKS.—R. Z. Jimenez, Consult. Engr., 44 Broad St., New York, wants the address of contractors to build pontoon dry docks in Cuba.

CEMENT.—Washington, D. C.—Bids are asked by the district commissioners until Sept. 28 for furnishing natural hydraulic cement, as stated in our advertising columns.

PIER WORK.—New York, N. Y.—The dock commissioners will award the contract in about 30 days, according to daily papers, for rebuilding pier, new, 43, at a cost of about $30,000.

PIER.—Palm Beach, Fla.—As soon as the extension of the Florida East Coast Line Ry. is completed from West Palm Beach to this place an ocean pier will be built at the terminus. Press reports state that the pier will extend into the ocean 1,000 ft., and that the contract has been awarded to Capt. R. G. Ross, of Jacksonville. Pres., H. M. Flagler, New York.

PIER WORK AND DREDGING.—Philadelphia, Pa.—Bids are asked until Sept. 23 for repairing landing piers and dredging between piers at Pea Patch Island, Delaware River. Maj. C. W. Raymond, U. S. Engr.

SEA WALL.—Revere, Mass.—The following bids were received for building the Leverett Ave. sea wall: D. D. Scanlan & Co., $6,900; J. H. White, $4,629; C. G. Denny & Co., $6,435; Geo. H. Smith & Co., $5,500; Geo. Dugan, $3,983.

SALE OF DREDGE.—New York, N. Y.—Bids are asked until Sept. 18 for the purchase of the U. S. hull and machinery of dredge "Flood Rock," as stated in our advertising column. Lieut.-Col. G. L. Gillespie, U. S. Engr. Office.

SUBWAY.—Philadelphia, Pa.—Local papers state that the specifications for the Reading subway are nearly completed. It is stated that two electric fans will be used to keep the air moving in the tunnel, at an additional expense of $225,000.

BRONZE TABLET.—Washington, D. C.—Bids are asked until Oct. 26 for furnishing and erecting in Gettysburg military park a bronze tablet having upon it a medallion of Abraham Lincoln and his address at the dedication of the national cemetery. Col. John M. Wilson, Engr. Pub. Bldgs. and Grounds.

DREDGING, ETC.—Port Huron, Mich.—Bids are asked until Oct. 1 for constructing a canal for flushing purposes from Lake Huron to Black River, about 7,000 ft., as stated in our advertising columns. The borings for this work were begun last fall and are now being completed. F. F. Rogers, Cy. Engr.; F. D. Jenks, Secy. Com.

DITCH WORK.—St. Paul, Minn.—Bids are asked until Sept. 17 for labor and material necessary in cutting ditches in Marshall and Clay counties, for improving the Middle River in Marshall county, about 125,000 cu. yds., and Felton Canal, 170,000 cu. yds., and Whiskey Creek, 35,000 cu. yds., in Clay county, in accordance with plans and specifications on file with the secretary of state. Ezra G. Valentine, Pres. Red River Valley Drainage Comn.; P. W. Wildt, Asst. Secy. of State.

STATE CANAL WORK.—Albany, N. Y.—The following contracts were awarded Sept. 3: For a vertical wall at Turner St., Utica, to James J. Dwyer, of Utica, at $7,384; vertical wall at Higginsville, to Lauer, Hageman, Brayer & Albaugh, Rochester, at $2,042; ditch and iron culvert to drain a part of the town of Pendleton, Niagara county, to Frank J. Le Valley, Lockport, at $17,800; vertical wall at Clay and Hubbell Sts., Utica, to Lauer, Hageman, Brayer & Albaugh, Rochester, at $2,042.

CONTRACT PRICES.

BRICK PAVING.—Brooklyn, N. Y.—N. P. Lewis, Engr. Local Improvements, has sent us a statement of the bids received Sept. 4 for three contracts for paving with vitrified brick. Nevins St. is now paved with granite blocks and the old blocks are to remain the property of the city, and be hauled by the contractor to the corporation yards. The new pavement on this street will be laid on 6 ins. of concrete. McDonough St. is now paved with cobblestones, which are to become the property of the contractor, the new pavement being laid on 5 ins. of concrete. The bids for Nevins St. were as follows:

Quantities.	E. J. McKeever & Bro., $21,685.	Fruin-Bambrick Const'n Co., $20,567.	Eastern Bermudez A. P. Co., $18,335.	Cranford & Co., $18,056.
Asphalt pavement ..8,967 sq. yds.	$1.67	$1.57	$1.30	$1.30
New curb .....1,915 lin. ft..	.70	.80	.70	.70
Old curb redressed..2,873 " "	.30	.20	.30	.30
Concrete foundation, 997 cu.yds.	4.50	4.38	4.50	4.20
Reflagging ..... 300 sq. ft..	.07	.05	.03	.03

The bids for paving St. Mark's Ave., from Vanderbilt Ave. to Franklin Ave., with asphalt over cobblestones were as follows:

Quantities.	E. J. McKeever & Bro.	Cranford & Co.	Eastern Bermudez A. P. Co.
Asphalt pavement...14,370 sq. yds.	$1.67	$1.30	$1.30
Repair'g cobblestone,14,370 " "	.30	.30	.30
Lane improvement... 3,373 lin. ft.,	.30	.30	.20
New curb, ... 2,688 " "	.70	.70	.60
Old curb redressed.. 4,031 " "	.25	.20	.20
Reflagging ..... 400 sq. ft...	.07	.03	.03
	$32,238	$26,704	$26,008

ASPHALT PAVING.—Schenectady, N. Y.—The common council has let the contract for paving Washington Ave. with sheet asphalt to the Metropolitan Paving & Construction Co., of Schenectady, at $2.69 per sq. yd. for paving and 84 cts. per lin. ft. for 5-in. blue stone curb, set in concrete. The same company is now at work on a similar contract at that place.

DREDGING.—New York, N. Y.—Geo. S. Terry, Secy. Dept. of Docks, informs us that the contract for dredging on the North River, between the Battery and West 34th St., was awarded Aug. 27, to the Morris & Cumings Dredging Co., at 17½ cts. per cu. yd. The contract for dredging on the North River, north of West 34th St., was awarded to P. Sanford Ross, of 113 Hudson St., Jersey City, at 17¾ cts. per cu. yd. There being only one bid on the contract for dredging on the East and Harlem rivers, the commissioners decided to reject same and readvertise, which has been done, and the bids were to be opened Sept. 10.

LAYING WATER MAIN.—Boston, Mass.—J. W. Swan, Secy. Comrs., writes us that the following bids were received Sept. 5 for laying about 4,070 lin. ft. of 42-in. water pipe, in Huntington Ave: J. B. O'Rourke & Co., $2.08 per lin. ft.; D. F. O'Connell, $2.19; Collins & Ham, $2.50; H. P. Nawn, $2.57, all bidders residents of Boston.

EXCAVATING CHANNEL.—Lafayette, Ore.—T. H. Dupuy, Secy. Bd. of Trade, writes us that the following bids were received Aug. 24 for excavating a channel 40 ft. wide in Yamhill River, the work including the removal of 6,612 cu.yds.of rock: Bullen Bridge Co., Portland, Ore., $6,900; Smyth & Perham, Oregon City, Ore., $1.19 per cu. yd.; John Bradley, Dayton, Ore., 60 cts. per cu. yd.; J. Bloodsworth, Dayton, Ore., 60 cts.

ASPHALT AND BRICK PAVING.—Williamsport, Pa.—The contract for paving Mulberry St. with 2½ ins. of asphalt on 6 ins. of concrete, has been awarded to the Sicilian Asphalt Paving Co., of New York, at $2.79 per sq. yd.; curbing, 70 cts. per ft.; repaving, $3.15 per sq. yd. The contract for repaving Pine St., from Third St. to Front St., with brick on the present macadam foundation, has been awarded to David P. Guise, of Williamsport, at 95 cts. per sq. yd. for paving with the D. P. Guise brick, 60 cts. for curbing, $6 for concrete, and $3 for repaving openings. Ward & Stucker,

Bids Received at Brooklyn, N. Y., for Brick Paving.

Quantities.	E. J. Keever & Bro.*	Robert Fury.	M. J. Dady.*	Wilson-Baillie Mfg. Co.**	Jas. F. Gillen.**
Brick, cement joints.....3,000 sq. yds.	$2.59	$2.40	$2.14	$1.60	$1.57
" sand "	2.59	2.34	2.15	1.60	1.57
New curb ..... 910 lin. ft..	.64	.72	.55	.70	.69
Old curb, redressed ..... 910 " "	.25	.30	.27	.15	.15
Concrete foundation ..... 500 cu. yds.	4.19	4.20	4.50	4.75	4.60
Blue stone bridging ..... 100 sq. ft..	.09	.09	.09	.09	.09
Reflagging .....1,000 " "	.05	.05	.05	.04	.03
Relaying intersections ..... 110 sq. yds.	.28	.30	1.00	.60	.75
Total, cement joints $10,756	$10,311	$9,574	$8,055	$7,887
" sand " 10,756	10,131	9,606	8,055	7,887

* Canton brick. ** Mack brick.

BRICK AND STONE PAVING.—Elmira, N. Y.—We are informed that the paving and other work done in this city this year, except the city hall and bridges, have been small contracts. Exchange Place is a small side street, one block in length. Ward, Clark & Hayes, of Elmira, were awarded the contract for paving it with Medina stone on sand foundation, at $2.65 per sq. yd. They were also awarded the contract for paving one block on Market St. with U. S. vitrified brick, on sand foundation, at $1.42 per sq. yd. Costello & Neagle, of Elmira, were awarded contracts for paving portions of State and Fifth Sts. with Daneker or White Haven granite on concrete foundation, at $2.91½ per sq. yd., and a block on Second St. with repressed brick or block, on a concrete foundation, at $2.17 per sq. yd. Thos. Spence, Cy. Clk.

SEWERS.—Chester, Pa.—Jas. B. Campbell, Cy. Clk., writes us that the contract for constructing a 24-in. brick sewer in Eighth St., has been awarded to J. B. Holmes, 370 Parker St., Chester, at $1.47 per ft.; manholes, $18; slants, 25 cts.; inlets, $57; rock excavation, $2. Reilly & Hanna, of Chester, were the only other bidders.

ASPHALT PAVING.—Brooklyn, N. Y.—Bids were received Aug. 30 for paving portions of 10 streets with asphalt, Cranford & Co., being the lowest bidders on nine of the contracts, at $65,287. The bids for paving Hancock St., from Sumner Ave. to Reid Ave., with asphalt on concrete foundation were as follows; N. P. Lewis, Engr. Local Improvements:

Quantities.	E. J. McKeever & Bro., $21,685.	Fruin-Bambrick Const'n Co., $20,567.	Eastern Bermudez A. P. Co., $18,335.	Cranford & Co., $18,056.
Asphalt pavement ..8,967 sq. yds.	$1.67	$1.57	$1.30	$1.30
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BRICK PAVING.—Logansport, Ind.—T. L. Reed, Cln. St. Com., writes us that the contract for paving

BRICK PAVING.—Louisville, Ky.—J. Henry Hoertz, Secy. Bd. Pub. Wks., writes us that the following contracts were awarded Aug. 30 for paving with one course of vitrified brick on a concrete foundation:

R. L. Clark	274	squares,	at $19.50
E. L. Colston	52.5	" "	17.00
J. Scherzer	58.6	" "	16.75
R. L. Clark	148	" "	15.90
R. L. Clark	177	" "	16.25
R. L. Clark	75	" "	17.60
L. R. Figg	75	" "	18.00
Lawler & Saffrau	95.8	" "	17.50
R. L. Clark	120	" "	17.00
L. R. Figg	119	" "	20.50

Market St. has been awarded to the Talbot Paving Co., of Detroit, Mich., at $1.52 per sq. yd. for 8-in. concrete foundation, and 1 course of Poston blocks; oolitic stone curbing at 60 cts. per lin. ft. Stevens & Bedwards, of Logansport; the Des Moines Paving Co., of Des Moines, Ia.; and Eaton & Frey, of Lafayette, Ind., were the other bidders.

CAST IRON PIPE.—Lowell, Mass.—We are informed that the following bids were received Aug. 29 for furnishing 700 tons of 24-in. pipe, as advertised in Engineering News:

Chattanooga Foundry & Pipe Works,.....	$21.75
F. B. Hawkins & Co.	*20.40
Reading Foundry & Machine Co.	*22.60
Warren Foundry & Machine Co.....	23.80
McNeal Pipe & Foundry Co.	24.91
R. D. Wood & Co., ...	22.80
Charles Millar & Son .....*$22.00 and	24.64

* Price per net ton; other bids are per gross ton.

The contract was not awarded for the reason that the city has not been able to get the expected amount of water from the driven-well plant and wishes to defer action for a week or ten days, and the Chattanooga Co. has agreed to hold its bid good for that time.

ASPHALT BLOCK PAVING.—Hartford, Conn.—The contract for paving State St. has been awarded to the Hartford Paving & Construction Co., at $3.04 per sq. yd. for Hastings asphalt blocks. The pavement will be similar to that already laid in Pearl St.

SEWERS.—Williamsport, Pa.—Contracts for constructing sewers have been awarded to D. P. Guise, at $3,278 and $8,394, and to Ward & Stucker, at $22,347. The bids for the latter contract were as follows:

Bids Received at Williamsport, Pa., for Constructing a Sewer.

Quantities.		Ward & Stucker, Harrisburg, Pa.	Flanagan & O'Hara, Scranton, Pa.	Jas. McCloud & Co., Williamsport, Pa.	D. P. Guise, Williamsport, Pa.	J. McCann, Philadelphia, Pa.	A. H. Coon's Sons, Kingston, Pa.	Rodgers Const'n Co., Tonawanda, N. Y.
48 × 32-in. brick	3,520 ft.	$5.18	$5.50	$5.74	$6.25	$6.10	$6.30	$6.75
33-in. brick	37 "	2.71	5.50	3.25	4.00	5.00	3.00	3.27
30-in. brick	23 "	2.60	5.50	3.25	4.00	5.00	3.00	3.07
15-in. pipe	220 ft.	.64	.95	.80	.65	.83	.80	.87
15-in pipe	700 "	.92	.95	1.00	.80	.10	1.10	.87
10-in. brick	3,120 "	.48	.75	.60	.50	.57	.70	.67
10-in. pipe	45	.86	.85	1.50	.87	.90	.90	1.35
15 × 6-in Y's	141	.46	.45	.80	.44	.50	.50	1.00
10 × 6-in. Y's	65.00	32.00	37.00	45.00	40.00	70.00	70.00	
Manholes on brick sewer	13	43.00	32.00	30.00	28.00	40.00	30.00	35.00
Manholes on pipe sewers	14	30.00	60.00	35.00	25.00	50.00	50.00	50.00
Catchbasins	4	5.50	4.50	5.00	6.00	5.50	7.00	4.75
Concrete, per cu. yd		14.00	15.00	18.00	16.00	17.00	16.00	13.00
Extra brickwork, per M		.15	.25	.25	.06	.50	.45	.37
4-in. drain tile, per ft		.40	.40	.50	.30	.60	.45	.85
House connections								
Totals		$22,347	$24,110	$24,369	$25,681	$25,754	$27,127	$28,644

METAL MARKET PRICES.

LEAD.—New York: 3.4 to 3.5 cts. Chicago 3.32 to 3.35 cts. St. Louis: 3.17 to 3.2 cts.

BARB WIRE.—Pittsburg: $2.70 and $2.80 for galvanized, and $2.30 and $2.40 for painted in carload and less than carload lots at mill.

FOUNDRY AND PIG IRON.—New York: $12.25 to $14. Pittsburg: $12.75 to $13.75. Chicago: $13 to $14.50.

TRACK MATERIAL.—New York: angle bars, 1.4 to 1.5 cts.; spikes, 1.8 to 1.85 cts.; track bolts, 2 to 2.2 cts. with square, and 2.1 to 2.2 cts. with hexagon nuts. Chicago: angle bars, 1.55 to 1.75 cts.; spikes, 1.9 to 2 cts.; track bolts, 2.3 to 2.4 cts. with square and 2.5 cts. with hexagon nuts.

NAILS.—Pittsburg: $2.25 per keg for carload lots and $2.35 for less than carload lots, for wire nails at mill; $1.80 and $1.85 for cut nails at mill. Chicago: $2.40 and $2.50 for wire nails, $2 and $2.05 for cut nails. New York: $2.40 and $2.50 for wire nails, and $1.95 and $2.05 for cut nails.

RAILS.—New York: $24 at eastern mills and $24.75 at tidewater; old rails, $13.50 to $15.50 to $16 for iron, and $13.50 to $14 for steel; light rails, $26 to $28; girder rails, $26. Pittsburg: $22 for standard sections of 45 lbs. and over; $23 for light sections; old rails, $15 to $15.50 for iron, and $13 to $14 for steel. Chicago: $25 to $27 for standard sections; $25 for light sections; old rails, $16 to $17 for iron, and $13 to $15 for steel. The New York "Journal of Commerce" says that the steel rail manufacturers' association has been in conference, and have made an advance in prices, the advance being probably not less than $2 per ton. Prior to the meeting a few contracts were closed at the $24 f. o. b. mill rate and several lots of light section tees were sold at $25 to $26. It is doubtful if the latter can be bought now at less than $28 to $29, since the available supply is in the hands of one firm.

STRUCTURAL MATERIAL.—New York: beams, 1.75 to 2.2 cts.; channels, 1.85 to 2 cts.; angles, 1.65 to 1.8 cts.; tees, 1.85 to 2 cts.; universal mill plates, 1.9 to 1.95 cts.; steel plates, 1.95 to 2 cts. for tank, 2 to 2.1 cts. for shell, 2.1 to 2.25 cts. for flange, 2.4 to 2.5 cts. for ordinary firebox, 2.6 to 2.75 for locomotive firebox. Pittsburg: beams, 1.6 to 2 cts.; channels, 1.6 to 2 cts.; angles, 1.5 to 1.6 cts.; tees, 1.6 to 1.7 cts.; Z-bars, 1.6 to 1.7 cts.; universal mill plates, 1.8 to 1.9 cts.; steel plates, 1.9 to 2 cts. for tank, 2 to 2.1 cts. for shell, 2.1 to 2.2 cts. for flange, 2.5 cts. for ordinary firebox, 2.5 to 4 cts. for locomotive firebox. Chicago: beams, 1.75 to 1.9 cts.; channels, 1.75 to 1.9 cts.; angles, 1.75 to 1.85 cts.; tees, 1.95 to 2 cts.; universal mill plates, 2.15 to 2.25 cts.; steel plates, 2.2 to 2.3 cts. for tank, 2.35 to 2.5 cts. for flange, 2.8 to 2.9 cts. for ordinary firebox, 4.5 to 4.75 cts. for locomotive firebox.

INDUSTRIAL NOTES.

THE BROOKS LOCOMOTIVE WORKS, of Dunkirk, N. Y., has built 10 eight-wheel engines for the St. Louis, Iron Mountain & Southern R. R.

THE AMERICAN SHIP WINDLASS CO., of Providence, R. I., has supplied its steam towing machine to several new tow barges for the Great Lakes.

EPPINGER & RUSSELL, of New York, have supplied the New York Equipment Co. with 20,000 creosoted ties for the Jamaica Ry. in the West Indies.

THE MEURER BROTHERS CO., of Brooklyn, N. Y., has its tin-plate plant running to its full capacity with orders which will keep it busy for some time to come.

THE BUDA FOUNDRY & MFG. CO., of Harvey, Ill., manufacturing hand cars, dump cars, tools, etc., is enlarging its works so as to double the capacity of the plant.

THE UNITED STATES IRON & TIN-PLATE MFG. CO., of Demmler, Pa., has its plant in full operation in all departments, and has orders ahead for several months.

THE DAVIS FOUNDRY & MACHINE WORKS, of Rome, Ga., has the contract for two 25-in. turbine water-wheels for the 280 HP. electric power plant near Elberton, Ga.

THE PURITY OIL FILTER CO., of Pittsburg, Pa., has sold filters recently to the Essen Coal Co., of Pittsburg, and the Kittanning Electric Light & Power Co., of Kittanning, Pa.

THE J. E. PORTER CO., of Ottawa, Ill., is putting up a new building, 175 × 60 ft., and an extension to its foundry, 112 × 60 ft., and will move its pump factory from Turner to Ottawa.

THE NATIONAL PAINT WORKS, of Williamsport, Pa., is supplying the paint for the Park Ave. viaduct, New York, the Louisville & Jeffersonville bridge, and the new terminal station at Providence, R. I.

THE DUNBAR FURNACE CO., of Dunbar, Pa., is erecting 50 by-product ovens, which will be completed by winter, and these are said to be the only ovens of the kind in the Connellsville coke region.

THE MICHIGAN PENINSULAR CAR CO., of Detroit, Mich., has built 300 gondola cars for the H. C. Frick Coke Co., and these cars are equipped with Janney couplers, air-brakes and standard grab-irons.

THE WHITE & MIDDLETON GAS ENGINE CO., of Baltimore, Md., has furnished a 60-HP. gasoline engine for driving the dynamos of the electric-light plant in the Vanderbilt residence at Biltmore, N. C.

THE BALL ENGINE CO., of Erie, Pa., has furnished the engines and boilers for the municipal electric-light plant of West Point, Ga., and a 125-HP. engine for the electric-light plant of the Cotton States Exhibition at Atlanta, Ga.

THE ATLANTA STEEL & TIN-PLATE CO., of Atlanta, Ind., will double the capacity of its plant, and it is expected to have the entire plant of 18 mills in operation by January. The capital of the company, which has been increased, now amounts to $150,000.

THE PITTSBURG IRON & STEEL CO., of Pittsburg, Pa., which recently purchased the Soho Iron & Steel Works of the Moorhead-McCleane Co., has started up part of the plant, and it is expected to have every department in operation before the end of September.

THE SOUTHWARK FOUNDRY & MACHINE CO., of Philadelphia, Pa., is putting in eight compound blowing engines of new design at the Edgar Thomson furnaces at Bessemer, Pa., and has an order for two 44 × 48-in. Porter-Allen engines for the Apollo Iron & Steel Co.

THE TOTTEN & HOGG IRON & STEEL FOUNDRY CO., of Pittsburg, Pa., has completed the large tin-plate plant for the Laughlin Nail Co., at Martin's Ferry, O., which plant is one of the largest in the country and will manufacture tin-plates, terne plates, and black plates.

THE QUAST GAS ENGINE CO., of Strasburg, Ill., has been organized by Charles Quast, formerly of the Quast Gas & Gasoline Engine Co., of Bucyrus, O., which latter company has been dissolved. The new company is in the market for machinery for its machine shop and foundry.

THE BESSEMER LAND & IMPROVEMENT CO., of Bessemer, Ala., has purchased the Fort Payne and Attalla furnaces, the former being a coke furnace at Fort Payne, Ala., and the latter a charcoal furnace at Attalla, Ala., and will remove them to Bessemer, to be operated for basic steel.

THE ILLINOIS STEEL CO., of Chicago, Ill., has commenced the construction of a spike mill at Joliet, Ill. It is to be completed by December, and will have a capacity of 60 tons of spikes, bolts, nuts and washers per month, employing 300 men. The company will build four more Wellman open-hearth basic furnaces.

THE AETNA-STANDARD IRON & STEEL CO., at Bridgeport, O., is again in full operation in all departments, after a partial shut-down in July and August, for repairs. The company has its mills so arranged that it can make either black plates or a line of merchant sheets. About 1,500 hands are now employed.

THE LITCHFIELD CAR & MACHINE CO., of Litchfield, Ill., is said to have had application made for the appointment of a receiver, and also for the foreclosure of a $40,000 mortgage on that part of the plant located in Litchfield. The parties connected with the Memphis, Tenn., portion of the plant are also made parties to the suit.

JOHN SHIELDS, of Flemington, N. J., railway contractor, has a contract from the Philadelphia, Newtown & New York R. R. for building the twin arches across Tacony creek, near Crescentville station. These arches are 25 ft. span, 135 ft. long, and are to be of first-class masonry. He is also running stone crushers and has stone block quarries along the North Penn R. R., and has laid paving in Philadelphia.

THE HEIDENREICH CO., of Chicago, which has contracts on the Drainage Canal, is said to have made an assignment for the benefit of its creditors. The liabilities of the company are estimated at from $60,000 to $75,000, while it is said that the assets will be largely in excess of the last-named amount. The assignment was brought about by the inability of the company to meet its current liabilities.

THE CARNEGIE STEEL CO., of Pittsburg, Pa., is said to intend to erect six blast furnaces at Duquesne, which will require, inclusive of the cost of labor, the expenditure of $3,500,000. The present force of 1,700 men will be kept at work day and night for two years, provided the winters are not too severe for outside labor; if the winter is unfavorable it will require a much longer time to complete the work.

THE FOSTER ENGINEERING CO., of Newark, N. J., has recently equipped 15 locomotives of the Lehigh Valley R. R. with its inside safety boiler check-valves, and has just received an additional order from the same road for 30 more of these valves. The company has an order for a large number of pressure regulators and reducing valves for gunboats Nos. 7 and 9, now under construction at Newport News, Va.

THE MINNEAPOLIS ROLLING MILL, of Minneapolis, Minn., which has been standing in an incomplete condition since the spring of 1893, will now, it is said, proceed with the installation of machinery, and it is expected that manufacturing operations will begin in November. Six furnaces and three trains of rolls are to be built, and the initial capacity is to be 70 tons daily, with the expectation of working up 100 tons. It will manufacture bar iron, bolts, nuts, etc.

THE GOULDS MFG. CO., of Seneca Falls, N. Y., reports among its recent sales of triplex power pumps, an 8 × 10-in. pump, operated by a water wheel for the Lunenburg Water Co., of Lunenburg, N. Y.; a 1¾ × 2½-in. pump, operated by an electric motor, for the Plattsburg Light, Heat & Power Co., of Plattsburg, N. Y., and a 5 × 8-in. pump, operated by an electric motor, for Bagnall & Hilles, of Yokohama, Japan. The pumps sold are for pumping water, oil, hot liquor and paper stuff.

THE McAVOY VITRIFIED BRICK WORKS, of Phoenixville, Pa., built about 15 months ago, is manufacturing vitrified shale bricks for street paving and sewer work, and has a capacity of 30,000 brick per day, which is to be increased to 100,000. The shale from the quarry is passed through a crusher and a pug mill, and then through the brickmaking machines. The brick are kept 48 hours in the drying house and then burned in four Eudaly down-draft kilns. Pres., Thos. B. McAvoy; Man., Frank B. McAvoy.

THE WESTINGHOUSE MACHINE CO., of Pittsburg, Pa., has broken ground at Wilmerding, Pa., for its malleable iron works, which will be moved from Pittsburg to that place. The plant will adjoin the machine shops of the company, and when completed will have cost $50,000. Employment will be given to 800 men. The Westinghouse company is preparing also to move its rubber factory from Hoboken, N. J., to a new plant, which will cost $50,000, and employ from 500 to 700 hands. The product will be rubber bumpers for railway cars and rubber insulators.

THE PELTON WATER-WHEEL CO., of San Francisco, Cal., recently sent a power plant to Mexico which embraced two 67-in. three-nozzle Pelton wheels, having a capacity of 700 HP. running under a head of 100 ft. The station operates a jute factory located at Barrio-Nuve, state of Orizaba, some 60 miles inland from the port of Santa Cruz. These wheels are connected to four electric generators, and the power transmitted to the factory 1¼ miles distant. No line or counter-shafts are used, every machine in the factory being run by a separate motor, these varying from 1 to 20 HP., as required.

THE PAGE WOVEN WIRE FENCE CO., of Adrian, Mich., has contracted to build 30 miles of fencing complete for the Bangor & Aroostook R. R., in Northern Maine. It has also nearly completed 18 miles of 8-ft. fencing in the center of the Adirondack Mountains, to enclose a game preserve for Mr. Edward Litchfield, a leading capitalist of New York city, and the company states that from the present outlook it seems as though it will become a contractor for as well as a manufacturer of fencing. It has sent out three cars filled with elk, deer, bear and other animals to be exhibited at a large number of the leading state fairs of the country, and they will make a trip covering from three to six weeks each.

NEW COMPANIES.—Yough Coke & Chemical Co., McKeesport, Pa.; to manufacture coke, etc.; David S. Bissell, E. F. Woods and E. P. Douglas.

Harmony Brick Co., Brandt, Pa.; $30,000, with $3,000 paid in; Treas., Horace O. Rech.

Glen Rock Wire Cloth Co., Glen Rock, Pa.; $30,000; Joseph Dise, Israel Gladfelter and W. P. Seitz.

Hackensack Pressed Brick Co., Hackensack, N. J.; $200,000; D. A. Pell, David St. John and H. C. Stone.

California Asphalt Co., New York city; $30,000; Chas. H. Lalor, Jas. H. Covode and Eugene A. Philbin.

Maltby Mfg. Co., Brooklyn, N. Y.; $12,000; tools and machinery; F. D. Maltby, E. L. Maltby and C. W. Congdon.

West Roanoke Iron Co., Roanoke, Va.; $100,000; Pres., William Beury; Vice-Pres., John Cooper; Secy., J. L. Beury.

Lake Michigan Ferry Transportation Co., Peshtigo, Wis.; $360,000; Joseph Coleman, Chas. R. Hull, and T. J. Fleming.

CONTRACT WORK

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